B 3.7 PLANT SYSTEMS

B 3.7.8 Cooling Water (CL) System

BASES

BACKGROUND

The CL System is a shared system common to both units. The CL System provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, and a normal shutdown, the CL System also provides this function for various safety related and nonsafety related components. The safety related function is covered by this LCO.

The CL System consists of a common CL pump discharge header for the five CL (2 nonsafeguards, 2 safeguards, 1 that can be designated as safeguards or nonsafeguards) pumps that directs flow into two separate, 100% capacity, CL headers. Each header then supplies loops in the turbine and auxiliary buildings and containments for the two units.

Each safeguards CL train consists of:

a. One 100% capacity vertical safeguards pump (12 or 121 for Train A; 22 or 121 for Train B);

b. A header; and

c. Piping, valving, instrumentation and controls.

The vertical motor driven pump (121) may be directed to supply either CL header when aligned in its safeguards mode of operation. In this case, the vertical motor driven pump (121) may replace a vertical diesel driven pump.

The vertical motor driven pump may be powered from a pre-selected independent power source (one of the Unit 2 redundant

BASES

BACKGROUND (continued)

safeguards 4 kV buses and associated diesel generator, i.e., 121 CL pump can be aligned to fulfill a Train A or Train B function).

A single CL pump can provide sufficient cooling in one unit during the injection and recirculation phases of a postulated loss of coolant accident plus sufficient cooling to maintain the second unit in a safe shutdown condition.

The CL pump discharge header contains redundant motor-operated header isolation valves (MV-32034, MV-32035, MV-32036, and MV-32037) that assure at least one OPERABLE safeguards pump is aligned to each safeguards supply header when functioning under accident conditions.

The safeguards diesel driven pumps and the vertical motor driven pump (when aligned in the safeguards mode) supply the safeguards components after being automatically started upon receipt of a safety injection or header low pressure signal.

Principal post accident heat loads supplied by the CL System include Unit 1 diesel generators, control room chillers, component cooling (CC) heat exchangers, containment fan coil units, and the nonsafeguards instrument air compressors.

The cooling water supplied to all safeguards and nonsafeguards equipment from supply header A is normally discharged through the Train A CL return header to the Unit 1 Circulating Water (CW) return header. The cooling water supplied to all safeguards and nonsafeguards equipment from supply header B is normally returned through the Train B CL return header to the Unit 2 CW discharge header. The auxiliary feed pumps, safeguards traveling screens, and filtered water supplies do not have return lines.

The two CL return headers are connected through two normally closed, motor-operated isolation valves. An emergency dump to

BASES

BACKGROUND (continued)	grade is connected between the isolation valves. The dump to grade requires manual actuation of the motor valve, either locally or from the main control room. Each of the return headers discharges to a standpipe in the turbine building which directs the cooling water to the CW discharge piping. Each of the standpipes is equipped with an overflow line to the ground outside the turbine building. The CL System also provides the backup safeguards water supply to the Auxiliary Feedwater System (LCO 3.7.5). The CL System, in conjunction with the CC System, also cools the unit from residual heat removal (RHR) entry conditions to MODE 5 during normal and post accident operations, as discussed in the USAR (Ref. 1). The time required for this evolution is a function of the number of CC and RHR System trains that are operating. One CL train is sufficient to remove decay heat during subsequent operations in MODES 5 and 6. Additional information about the design and operation of the CL System, along with a list of the components served, is presented in the USAR (Refs. 1 and 2).
APPLICABLE SAFETY ANALYSES	The design basis of the CL System is to maintain cooling for the heat loads of one unit in MODE 3 and the second unit in long term post accident condition. One CL train, in conjunction with the CC System and a 100% capacity containment cooling system, has the capability to remove long term core decay heat following a design basis LOCA as discussed in the USAR (Ref. 2). This prevents the containment sump fluid from increasing in temperature during the recirculation phase following a LOCA and provides for a gradual reduction in the temperature of this fluid as it is supplied to the Reactor Coolant System by the Emergency Core Cooling System (ECCS) pumps. The CL System is designed to perform its function with a single

BASES

APPLICABLE SAFETY ANALYSES (continued)

failure of any active component, assuming the loss of offsite power. This assumes a maximum CL temperature of 95°F occurring simultaneously with design heat loads for the system.

The CL System satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Two CL trains are required to be OPERABLE to provide the required redundancy to ensure that the system functions to remove post accident heat loads, assuming that the worst case single active failure occurs coincident with the loss of offsite power.

A CL train is considered OPERABLE when:

a. The safeguards CL pump, aligned to the train, is OPERABLE;

b. The associated header is OPERABLE; and

c. The associated piping, valves, and instrumentation and controls required to perform the safety related function are OPERABLE.

A diesel driven safeguards CL pump is considered OPERABLE when:

a. The pump can meet the design flow/pressure requirements in accordance with the Inservice Testing Program;

b. The associated piping, valves, auxiliaries, and instrumentation and controls required to perform the safety related function are OPERABLE; and

c. There is a minimum fuel oil supply of 19,500 gallons available for the diesel driven safeguards pumps.

The 121 CL pump starts during low header pressure conditions and it functions as a backup source replacing a diesel driven safeguards

BASES

LCO (continued)

CL pump. In this latter case, additional requirements for OPERABILITY are specified.

121 CL pump is considered OPERABLE when:

a. The pump can meet the design flow/pressure requirements in accordance with the Inservice Testing Program; and

b. The associated piping, valves, and instrumentation and controls required to perform the safety related function are OPERABLE.

121 CL pump is considered OPERABLE as the safeguards substitute for 12 diesel driven CL pump when:

a. The pump can meet the design flow/pressure requirements in accordance with the Inservice Testing Program;

b. The associated piping, valves, and instrumentation and controls required to perform the safety related function are OPERABLE;

c. MV-32037 or MV-32036 are closed and the associated breaker is locked in the OFF position;

d. MV-32034 and MV-32035 are open and both breakers are locked in the OFF position; and

e. Bus 27 is supplied from Bus 25.

121 CL pump is considered OPERABLE as the safeguards substitute for 22 diesel driven CL pump when:

a. The pump can meet the design flow/pressure requirements in accordance with the Inservice Testing Program;

b. The associated piping, valves, and instrumentation and controls required to perform the safety related function are OPERABLE;

BASES

LCO
(continued)

c. MV-32034 or MV-32035 are closed and the associated breaker is locked in the OFF position;

d. MV-32036 and MV-32037 are open and both breakers are locked in the OFF position; and

e. Bus 27 is supplied from Bus 26.

A header is considered to be OPERABLE when the associated piping, valves, and instrumentation and controls can perform the required safety related functions:

a. Provide flow and cooling for the required safeguards components supplied from the header; and

b. Provide necessary isolation functions required for the header during a safeguards actuation.

Removal of return header piping or components from service does not automatically make the system inoperable. Factors to consider during an OPERABILITY determination are:

a. If the piping or component inoperability results in an individual component being incapable of heat removal, the individual component is to be considered inoperable;

b. If the piping or component inoperability results in required components in a train being incapable of heat removal, the train is to be considered inoperable; and

c. If cooling flow for the required components can be maintained by opening the emergency dump to grade path, by routing to the other unit's discharge header, or overflow from the turbine building standpipes, the train or components are not considered inoperable.

BASES (continued)

APPLICABILITY

The CL System specification is applicable for single or two unit operation.

In MODES 1, 2, 3, and 4, the CL System is a normally operating system that is required to support the OPERABILITY of the equipment serviced by the CL System and required to be OPERABLE in these MODES.

In MODES 5 and 6, the OPERABILITY requirements of the CL System are determined by the systems it supports.

ACTIONS

A.1

If no safeguards CL pumps are OPERABLE for one train, action must be taken to restore one CL safeguards pump to OPERABLE status within 7 days.

Either the diesel driven CL pump for the train may be restored to OPERABLE status, or the 121 CL pump may be aligned to fulfill the safeguards function for the train that has no OPERABLE safeguards CL pump.

The 7 day Completion Time is based on:

a. Low probability of loss of offsite power during the period;

b. The low probability of a DBA occurring during this time period;

c. The safeguards cooling capabilities afforded by the remaining OPERABLE train; and

d. The capability to route water from the non-safeguards pumps, if needed.

BASES

ACTIONS

A.1 (continued)

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for combinations of Conditions A and B to be inoperable during any continuous failure to meet this LCO for these Conditions.

The 10 day Completion Time provides a limitation time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The AND connector between 7 days and 10 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

Required Action A.1 is modified by 3 Notes. Note 1 requires Unit 1 entry into the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources-Operating," for an emergency diesel generator made inoperable by the CL System. For Unit 1, the diesel generators are major heat loads supplied by the CL System. Thus, inoperability of two safeguards CL pumps will affect at least the heat loads on one CL header, including one Unit 1 diesel generator. Inability to adequately remove the heat from the diesel generator will render it inoperable.

Note 2 requires entry into the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops-MODE 4", for both units for the RHR loops made inoperable by the CL System. If either unit is in MODE 4, inoperability of two safeguards CL pumps may affect all the heat loads on one CL header, including a CC train and subsequently one RHR heat exchanger on each unit. Inability to adequately remove the heat from a RHR heat exchanger will render it inoperable.

BASES

ACTIONS

A.1 (continued)

Note 3 specifies that the Condition with no safeguard CL pumps OPERABLE for one train may not exist for more than 7 days in any consecutive 30 day period. If such a condition occurs, Condition C must be entered with the specified Required Action taken because the equipment reliability is less than considered acceptable.

B.1, B.2 and B.3

If one CL supply header is inoperable, action must be taken to verify the vertical motor driven CL pump and the opposite train diesel driven CL pump are OPERABLE within 4 hours, and restore the inoperable CL header to OPERABLE status within 72 hours.

Verification of vertical motor driven CL pump OPERABILITY does not require the pump to be aligned and may be performed by administrative means. Verification of the opposite train diesel driven CL pump may be performed by administrative means. Completion of the CL pump surveillance tests is not required.

Conditions may occur in the CL System piping, valves, or instrumentation downstream of the supply header (e.g., closed or failed valves, failed piping, or instrumentation in a return header) that can result in the supply header being considered inoperable. In such cases, Condition B and related Required Actions shall apply.

In this Condition, the remaining OPERABLE CL header is adequate to perform the heat removal function. However, the overall redundancy is reduced because only a single CL train remains OPERABLE.

BASES

ACTIONS

B.1, B.2 and B.3 (continued)

Required Action B.1 ensures that the vertical motor driven 121 CL pump may be used to provide redundancy for the safeguards CL pump on the OPERABLE header. Required Action B.3 assures adequate system reliability is maintained.

The second Completion Time for Required Action B.3 establishes a limit on the maximum time allowed for combinations of Conditions A and B to be inoperable during any continuous failure to meet this LCO for these Conditions.

The 10 day Completion Time provides a limitation time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The AND connector between 7 days and 10 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

Required Actions B.1, B.2, and B.3 are modified by two Notes.

The first Note indicates that the applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources-Operating," should be entered for Unit 1 since an inoperable CL train results in an inoperable emergency diesel generator.

The second Note indicates that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops-MODE 4," should be entered if an inoperable CL train results in an inoperable decay heat removal train. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components.

BASES

ACTIONS

B.1, B.2 and B.3 (continued)

The 4 and 72 hour Completion Times are based on the redundant capabilities afforded by the OPERABLE train, and the low probability of a DBA occurring during this time period. In addition, the 4 hour Completion Time for Required Actions B.1 and B.2 is within the time period anticipated to verify OPERABILITY of the required CL pump by administrative means.

C.1 and C.2

If at least one safeguards CL pump for a train or a CL supply header cannot be restored to OPERABLE status within the associated Completion Time, the units must be placed in a MODE in which the LCO does not apply. To achieve this status the units must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

D.1

In this Condition, the 14 day fuel oil supply for the diesel driven CL pumps is not available. However, the Condition is restricted to fuel oil supply reductions that maintain at least a 12 day supply. This restriction allows sufficient time for obtaining the requisite replacement volume and performing the analyses required prior to addition of fuel oil to the tank(s). A period of 48 hours is considered sufficient to complete restoration of the required supply prior to declaring the diesel driven CL pumps inoperable. This period is acceptable based on the remaining 12 day fuel oil supply, the fact

BASES

ACTIONS

D.1 (continued)

that procedures will be initiated to obtain replenishment, availability of the vertical motor driven CL pump and the low probability of an event during this brief period.

The second Completion Time for Required Action D.1 establishes a limit on the maximum time allowed for combinations of Conditions A and D to be inoperable during any continuous failure to meet this LCO for these Conditions.

The 9 day Completion Time provides a limitation time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and D are entered concurrently. The AND connector between 48 hours and 9 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

E.1

With the stored fuel oil supply not within the limits specified or Required Actions and associated Completion Times of Condition D not met, the diesel driven CL pumps may be incapable of performing their intended function and must be immediately declared inoperable.

SURVEILLANCE REQUIREMENTS

SR 3.7.8.1

This SR is modified by a Note indicating that the isolation of the CL System components or systems may render those components inoperable, but does not affect the OPERABILITY of the CL System.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.8.1 (continued)

This SR verifies the correct alignment for manual, power operated, and automatic valves in the CL System flow path to assure that the proper flow paths exist for CL System operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified to be in the correct position prior to being locked, sealed, or secured. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. Control room indication may be used to fulfill this SR. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

SR 3.7.8.2

This SR verifies each diesel driven CL pump can be started and be up to operating speed and assumes load within one minute to provide assurance that equipment would perform as expected in the safety analysis.

Diesel CL pump start will normally be initiated by the manual start switch. Once per calendar year, start should be initiated by use of the low pressure header pressure switch.

The 31 day Frequency is based on the experience that the CL pump usually passes the Surveillance when performed at this Frequency.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.3

This SR provides verification that there is an adequate inventory of fuel oil in the storage tanks to support the operation of one diesel driven CL pump for 14 days. The 14 day period is sufficient time to place the unit in a safe shutdown condition and to bring in replenishment fuel from an offsite location.

The specified fuel oil inventory for the diesel cooling water pumps is in addition to the fuel oil inventory specified for the Unit 1 diesel generators (DGs) (LCO 3.8.3) that must be available in the Unit 1 diesel fuel oil storage system. There are four Design Class I fuel oil storage tanks for the Unit 1 DGs and two Design Class I fuel oil storage tanks for the diesel driven cooling water pumps. These six Design Class I tanks are interconnected such that any tank can be manually aligned to supply any Unit 1 DG or diesel driven cooling water pump day tank. Any combination of inventory in these six tanks may be used to satisfy the inventory requirements for the diesel driven cooling water pumps and the Unit 1 DGs. Since the fuel oil for the CL pumps comes from the common fuel oil tanks shared by the Unit 1 diesel generators, the testing and the quality of the fuel oil is controlled by Technical Specification 5.5.11, "Diesel Fuel Oil Testing Program."

The 31 day Frequency is adequate to ensure that a sufficient supply of fuel oil is available, since low level alarms are provided and plant operators would be aware of any large uses of fuel oil during this period.

SR 3.7.8.4

This SR verifies the vertical motor driven CL pump is OPERABLE to provide assurance that equipment, when lined up in the safeguards mode, will perform as expected in the safety analysis.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.8.4 (continued)

For this test, an acceptable level of performance shall be:

a. Pump starts and reaches required developed head; and

b. Control board indications and visual observations indicate that the pump is operating properly for at least 15 minutes.

The 92 day Frequency is based on the Inservice Testing Program requirements (Ref. 3).

Under some plant conditions, the vertical motor driven CL pump is required to operate to provide additional CL flow. When this pump is operated to support plant operations, this test can not be performed and this pump is considered inoperable as a safeguards CL pump.

SR 3.7.8.5

This SR verifies proper automatic operation of the CL System valves on an actual or simulated safety injection actuation signal, including those valves that isolate non-essential equipment from the system. The CL System is a normally operating system that is shared between the two units and cannot be fully actuated as part of normal testing. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls.

These tests demonstrate the operation of the valves, pump circuit breakers, and automatic circuitry.

Unit 1 SI actuation circuits for Train A and Train B valves shall be tested during Unit 1 refueling outages. Unit 2 SI actuation circuits for Train A and Train B valves shall be tested during Unit 2 refueling outages.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.8.5 (continued)

A test is considered satisfactory if control board indication and visual observations indicate that all components have operated satisfactorily and if cooling water flow paths required for accident mitigation have been established.

The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during an outage of one unit (the other unit may be operating) and the potential for an unplanned transient in the unit affected by the tested components if the Surveillance were performed with that reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed. Therefore, the Frequency is acceptable from a reliability standpoint.

SR 3.7.8.6

The safeguards CL pumps may be actuated by either a safety injection (SI) signal or system low pressure. This SR verifies proper automatic operation of the diesel driven and vertical motor driven CL pumps on an actual or simulated safety injection actuation signal and verifies proper automatic operation of these pumps on an actual or simulated low pressure actuation signal. The CL is a normally operating system that cannot be fully actuated in a safeguards mode as part of normal testing during normal operation. A test is considered satisfactory if control board indication and visual observations indicate that all components have operated satisfactorily.

The 24 month Frequency is based on the need to perform the SI signal portion of this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power.

BASES

SURVEILLANCE REQUIREMENTS	SR 3.7.8.6 (continued) Operating experience has shown that these components usually pass the Surveillance when performed. Therefore, the Frequency is acceptable from a reliability standpoint.
REFERENCES	1. USAR, Section 10.4. 2. USAR, Section 6. 3. ASME Boiler and Pressure Vessel Code, Section XI.

B 3.7 PLANT SYSTEMS

B 3.7.9 Emergency Cooling Water (CL) Supply

BASES

BACKGROUND

The Emergency CL Supply is designed to provide a supply of screened cooling water (CL) following an earthquake that destroys Dam No. 3, dropping the water level in the normal intake canal supply to the screenhouse. The Emergency CL Supply consists of the Emergency CL Line and the two Safeguards Traveling Screens.

The emergency pump bay, located within the safeguards section of the screen house, houses the safeguards traveling screens, the motor-driven vertical CL pump, and the diesel-driven vertical CL pumps. Two normally open sluice gates, one from each unit's circulating water (CW) pump bay, provide water to the vertical CL pumps. Sluice gates may be used to isolate the emergency bay from the CW pump bays.

Under design basis seismic event conditions, water will be supplied to the emergency bay through an Emergency CL. The 36 inch pipe, buried in the approach canal and Circulating Water Intake Canal bottom, directs water from the deepest part of the river to the emergency bay. The intake end of the pipe is covered with a screen to minimize the amount of trash drawn into the pipe. The Emergency CL is designed to provide adequate flow at the lowest possible water elevation resulting from loss of Dam No. 3. The pipe is buried approximately 40 feet below the Circulating Water Intake Canal water level.

Two safeguards traveling screens are designed to remove debris from the cooling water entering the emergency pump bay through the Emergency CL Line. Trash trays attached to the screens aid in carrying the trash to a trash trough. The screens have two speeds. The screens are backwashed with water supplied from the CL pump discharge.

BASES

BACKGROUND (continued)	Additional information on the design and operation of the Safeguards Traveling Screens and the Emergency CL Line can be found in Reference 1.
APPLICABLE SAFETY ANALYSES	The Design Basis Earthquake provides the basis for the Emergency CL Supply. This safety analysis assumes that Dam No. 3 is destroyed by the seismic event, such that supply through the Emergency CL Line is required. Under these conditions, trash removal by the safeguards traveling screens is required. The Emergency CL Supply satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).
LCO	This specification applies to single or dual unit operation. The Emergency CL Supply is a passive gravity fed supply to the safeguards CL pumps intended only for the case of a seismic event that destroys Dam No. 3 resulting in low level in the intake canal. In this low probability event, the safeguards traveling screens would be required to remove debris from the water supply to the pumps. Both safeguards traveling screens are required to be OPERABLE. A safeguards traveling screen is considered OPERABLE when: a. The valve, instrumentation and controls required to provide the screen backwash function are OPERABLE; and b. The safeguards traveling screen can turn.

BASES

LCO (continued)

Safeguards traveling screen OPERABILITY is not required for OPERABILITY of the safeguards CL pumps (LCO 3.7.8).

The Emergency CL Line is OPERABLE when a flow path through the pipe exists.

APPLICABILITY

With either unit in MODES 1, 2, 3, and 4, the Safeguards Traveling Screens and Emergency CL Line are required to support the OPERABILITY of the equipment serviced by the CL System during the design basis condition and required to be OPERABLE in these MODES.

With both units in MODE 5 or 6, the OPERABILITY requirements of the Emergency CL Supply are determined by the systems it supports. The design basis does not include shutdown conditions.

ACTIONS

A.1 and A.2

If one safeguards traveling screen is inoperable, action must be taken to verify an emergency bay sluice gate is open within 4 hours, and restore that safeguards traveling screen to OPERABLE status within 90 days.

BASES

ACTIONS

A.1 and A.2 (continued)

In this Condition, the remaining OPERABLE safeguards traveling screen or open emergency bay sluice gate is adequate to provide the CL supply to any of the three vertical CL pumps during any design basis condition.

Required Action A.1 is modified by a Note which states the action is not required during testing periods of less than or equal to 24 hours. The 24 hours allows testing of the emergency cooling water line which may require the sluice gates to be closed. This is acceptable based on plant experience to perform the required testing during this time period and the OPERABILITY of the other emergency traveling screen.

The 4 hour Completion Time is based on the redundant capability afforded by the OPERABLE safeguards traveling screen.

The 90 day Completion Time is based on:

a. The redundant capability afforded by the remaining OPERABLE safeguards traveling screen;

b. The low risk impact of an inoperable safeguards traveling screen; and

c. The low probability of a high magnitude earthquake that could destroy Dam No. 3 during this time interval.

BASES

ACTIONS (continued)

B.1 and B.2

If both safeguards traveling screens are inoperable, action must be taken to verify one emergency bay sluice gate is open within 1 hour, and restore one safeguards traveling screen to OPERABLE status within 7 days.

In this Condition, the open emergency bay sluice gate is adequate to perform the CL supply function except in those cases where use of the Emergency CL Line is needed. As a result, overall reliability is reduced.

The 7 day Completion Time is based on the low probability of a design basis earthquake occurring during this time interval.

C.1 and C.2

If the Emergency CL Line is inoperable, action must be taken to verify one emergency bay sluice gate is open within 1 hour, and restore the Emergency CL Line to OPERABLE status within 7 days.

The 1 hour and 7 day Completion Times are reasonable based on the low probability of a design basis earthquake occurring during the 7 days that the Emergency CL Line is inoperable, the availability through the normal operating path and associated traveling screens, and the time required to reasonably complete the Required Actions.

BASES

ACTIONS (continued)

D.1 and D.2

If the Emergency CL Line or Safeguards Traveling Screen(s) cannot be restored to OPERABLE status within the associated Completion Time, the units must be placed in a MODE in which the LCO does not apply. To achieve this status, the units must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.9.1

This SR verifies that the safeguards traveling screens can adequately filter (screen) water and that screens can backwash as needed.

This SR verifies that:

a. The backwash supply valve will open;

b. Backwash water pressure is sufficient; and

c. The safeguards traveling screens can turn.

The 92 day Frequency is based on operating experience that demonstrates this interval is sufficient to ensure screen and support equipment reliability.

REFERENCES

1. USAR, Section 10.4.

B 3.7 PLANT SYSTEMS

B 3.7.10 Control Room Special Ventilation System (CRSVS)

BASES

BACKGROUND

The CRSVS provides a protected environment from which operators can control the unit following an uncontrolled release of radioactivity.

The CRSVS consists of two independent, redundant trains that recirculate and filter the control room air. Each train consists of a prefilter, a high efficiency particulate air (HEPA) filter, an activated charcoal adsorber section for removal of gaseous activity (principally iodines), and a cleanup fan.

Ductwork, valves or dampers, and instrumentation also form part of the system.

The CRSVS is an emergency system, parts of which may also operate during normal unit operation.

Upon receipt of the actuating signal(s), normal air supply to the control room is isolated, and the stream of ventilation air is recirculated through the system filter trains. The prefilters remove any large particles in the air, and any entrained water droplets present, to prevent excessive loading of the HEPA filters and charcoal adsorbers.

Actuation of the CRSVS is initiated by:

a. High radiation in the control room ventilation duct; or

b. Safety injection signal.

Actuation of the system closes the unfiltered outside air intake and unfiltered exhaust dampers, and aligns the system for recirculation

BASES

BACKGROUND (continued)

of the control room air through the redundant trains of HEPA and the charcoal filters. The operating condition initiates filtered ventilation of the air supply to the control room.

The CRSVS operation is discussed in the USAR (Ref. 1).

Redundant supply and recirculation trains provide the required filtration should an excessive pressure drop develop across the other filter train. Normally open isolation dampers are arranged in series pairs so that the failure of one damper to shut will not result in a breach of isolation. The CRSVS is designed in accordance with Seismic Category I requirements.

The CRSVS is designed to maintain the control room environment for 30 days of continuous occupancy after a Design Basis Accident (DBA) without exceeding a 5 rem whole body dose or its equivalent to any part of the body.

APPLICABLE SAFETY ANALYSES

The CRSVS components are arranged in redundant, safety related ventilation trains. The location of components and ducting within the control room envelope ensures an adequate supply of filtered air to all areas requiring access. The CRSVS provides airborne radiological protection for the control room operators, as demonstrated by the control room accident dose analyses for the most limiting design basis loss of coolant accident fission product release presented in the USAR (Ref. 2). The CRSVS function also plays a significant role in protecting control room personnel during a fuel handling accident in the spent fuel pool enclosure or the containment and a main steam line break (Ref. 2).

BASES

APPLICABLE SAFETY ANALYSES (continued)

The worst case single active failure of a component of the CRSVS does not impair the ability of the system to perform its design function.

The CRSVS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

This LCO applies to single or dual unit operation since there is a single CRSVS for both units.

Two independent and redundant CRSVS trains are required to be OPERABLE to ensure that at least one is available assuming a single failure disables the other train. Total system failure could result in exceeding the whole body dose limit of 5 rem (Ref. 3) to the control room operator during the worst 4 week exposure following a postulated accident.

The CRSVS is considered OPERABLE when the individual components necessary to limit operator exposure are OPERABLE in both trains. A CRSVS train is OPERABLE when the associated:

a. Cleanup fan is OPERABLE;

b. HEPA filters and charcoal adsorbers are not excessively restricting flow, and are capable of performing their filtration functions;

c. Ductwork, valves, and dampers are OPERABLE, and air circulation can be maintained; and

d. Instrumentation, including associated radiation monitor for starting the cleanup fan, is OPERABLE, or the system is aligned to perform its safety function and is operating.

In addition, the control room boundary must be maintained, including the integrity of the walls, floors, ceilings, ductwork, and access doors.

BASES

LCO (continued)

Opening a door for personnel ingress or egress does not make the control room ventilation zone boundary inoperable. Blocking a door open (e.g., for maintenance) without a person present to close the door requires entry into an ACTION.

The LCO is modified by a Note allowing the control room boundary to be opened intermittently under administrative controls. For entry and exit through doors the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings, these controls consist of stationing a dedicated individual at the opening who is in continuous communication with the control room. This individual will have a method to rapidly close the opening when a need for control room isolation is indicated.

APPLICABILITY

In MODES 1, 2, 3, and 4 for either unit, CRSVS must be OPERABLE to control operator exposure during and following a DBA.

In addition, during movement of irradiated fuel assemblies, the CRSVS must be OPERABLE to cope with the release from a fuel handling accident.

ACTIONS

A.1

When one CRSVS train is inoperable, action must be taken to restore OPERABLE status within 7 days.

In this Condition, the remaining OPERABLE CRSVS train is adequate to perform the control room protection function. However, the overall redundancy is reduced because only a single CRSVS train remains OPERABLE.

BASES

ACTIONS

A.1 (continued)

The 7 day Completion Time is based on the low probability of a DBA or fuel handling accident occurring during this time period, and ability of the remaining train to provide the required capability.

B.1

If the control room boundary is inoperable in MODES 1, 2, 3, and 4, the CRSVS train cannot perform their intended functions. Actions must be taken to restore an OPERABLE control room boundary within 24 hours. During the period that the control room boundary is inoperable, appropriate compensatory measures should be utilized to protect control room operators from potential hazards such as radioactive contamination, toxic chemicals, smoke, temperature and relative humidity, and physical security. Preplanned measures should be available to address these concerns for intentional and unintentional entry into the condition. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, and the use of compensatory measures. The 24 hour Completion Time is a typically reasonable time to diagnose, plan and possibly repair, and test most problems with the control room boundary.

C.1 and C.2

In MODE 1, 2, 3, or 4, if the inoperable CRSVS train or control room boundary cannot be restored to OPERABLE status within the required Completion Time, both units must be placed in a MODE that minimizes accident risk. To achieve this status, the units must be placed in at least MODE 3 within 6 hours, and in MODE 5 within 36 hours.

BASES

ACTIONS

C.1 and C.2 (continued)

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

D.1 and D.2

If the inoperable CRSVS train cannot be restored to OPERABLE status within the required Completion Time, Required Action D.1 must be taken to immediately place the OPERABLE CRSVS train in operation. This is a reasonable action, based on engineering judgement, to assure the control room air is filtered in the event of an accident.

An alternative to Required Action D.1 is to immediately suspend activities that could result in a release of radioactivity that might require isolation of the control room. Required Action D.2 places the plant in a condition that minimizes risk. This does not preclude the movement of fuel to a safe position.

E.1

If two CRSVS trains are inoperable during movement of irradiated fuel assemblies, action must be taken immediately to suspend activities that could result in a release of radioactivity that might enter the control room.

This places the plant in a condition that minimizes accident risk. This does not preclude the movement of fuel to a safe position.

BASES

ACTIONS (continued)

F.1

If both CRSVS trains are inoperable in MODE 1, 2, 3, or 4, for reasons other than inoperable control room boundary (i.e., Condition B) the CRSVS may not be capable of performing the intended function and the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately for both units.

SURVEILLANCE REQUIREMENTS

SR 3.7.10.1

Standby systems should be checked periodically to ensure that they function properly. As the environment and normal operating conditions on this system are not too severe, testing each train once every month provides an adequate check of this system. Each train must be operated for ≥ 15 minutes to demonstrate the system functions. The 31 day Frequency is based on the reliability of the equipment and the two train redundancy availability.

SR 3.7.10.2

This SR verifies that the required CRSVS filter testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The VFTP includes testing the performance of the HEPA filter, charcoal adsorber efficiency, minimum flow rate, and the physical properties of the activated charcoal. Specific test Frequencies and additional information are discussed in detail in the VFTP.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.10.3

The CRSVS may be actuated by either a safety injection signal or a high radiation signal. This SR verifies that each CRSVS train starts and operates on an actual or simulated safety injection actuation signal and verifies each CRSVS train starts and operates on an actual or simulated high radiation signal. The Frequency of 24 months allows performance when a unit is shutdown.

SR 3.7.10.4

This SR verifies proper functioning of the CRSVS. During operation, the CRSVS train is designed to provide 4000 ± 10% cfm .

The Frequency of 24 months on a STAGGERED TEST BASIS is consistent with industry component reliability experience.

REFERENCES

1. USAR, Section 10.3.
2. USAR, Section 14.9.
3. 10 CFR 50 Appendix A, GDC Criterion 19.

B 3.7 PLANT SYSTEMS

B 3.7.11 Safeguards Chilled Water System (SCWS)

BASES

BACKGROUND	The SCWS, a shared system between the two units, circulates chilled water to provide ambient air cooling to essential areas, including the control room, Unit 1 safeguards 4160 VAC and 480 VAC safeguards bus rooms, residual heat removal (RHR) pump pits, relay room, and the event monitoring equipment room. The system functions during normal plant operations and accident conditions. The system function is to remove heat generated by safety related equipment and accident conditions. The SCWS consists of two separate, but normally cross-connected, closed 100% capacity loops. Each loop consists of a header with water chiller, expansion tank, chilled water pump, unit coolers, piping, valves, instrumentation, and controls. A safety injection (SI) signal closes the control room chiller outlet cross-connect air operated control valves, splitting the two headers so that each header is then supplied by the associated chilled water pump and chiller. The SCWS operation is discussed in the USAR (Ref. 1).
APPLICABLE SAFETY ANALYSES	The design basis of the SCWS is to remove heat produced by equipment located in the various rooms during worst case heatup scenarios. The heat removal rates exceed the design basis heat generation rates in the control room, Unit 1 safeguards 4kV and 480 VAC rooms, relay room, computer room, RHR pits, and event monitoring equipment room. In event of a single failure affecting one loop of safeguards chilled water, the alternate loop is able to meet required heat load demands. The SCWS satisfies Criterion 3 of 10 CFR 50.36 (c)(2)(ii).

BASES (continued)

LCO

The SCWS is a shared system between the two units.

Two 100% capacity loops of the SCWS are required to be OPERABLE to ensure that at least one is available, assuming a single failure.

Even if both loops should fail, operator actions are available in procedures to provide sufficient cooling to these rooms. The RHR pumps, 480V buses and 4kV buses can perform their functions without an immediate need for equipment heat removal and their long term OPERABILITY is handled by procedures as discussed in Reference 1. The control room and relay room can provide their functions for a shorter time period before replacement heat removal is required and long term operability is handled by procedures.

The SCWS is considered to be OPERABLE when the individual components (chiller and chilled water pump) necessary to maintain the supplied components and rooms are OPERABLE in both loops. A loop is OPERABLE when:

a. Chiller is OPERABLE;

b. Chilled water pump is OPERABLE;

c. Loop separation function, required during an accident, is OPERABLE; and

d. Supplied components are OPERABLE.

APPLICABILITY

In MODES 1, 2, 3, and 4 and during movement of irradiated fuel assemblies, the SCWS must be OPERABLE to ensure that the room temperatures will not exceed equipment operational requirements in the essential areas this system serves following an accident.

In MODES 5 and 6, the OPERABILITY requirements of the SCWS are determined by the systems it supports.

BASES (continued)

ACTIONS

A.1

With one SCWS loop inoperable, action must be taken to restore OPERABLE status within 30 days.

In this Condition, the remaining OPERABLE SCWS loop is adequate to provide cooling. However, the overall reliability is reduced because a single failure in the OPERABLE SCWS loop could result in loss of SCWS function.

The 30 day Completion Time is based on the low probability of an event requiring SCWS loop separation, the consideration that the remaining loop can provide the required protection, and that alternate safety or nonsafety related cooling means are available.

B.1 and B.2

In MODE 1, 2, 3, or 4, if the inoperable SCWS loop cannot be restored to OPERABLE status within the required Completion Time, the unit must be placed in a MODE that minimizes the risk.

To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

BASES

ACTIONS (continued)

C.1 and C.2

During movement of irradiated fuel, if the inoperable SCWS loop cannot be restored to OPERABLE status within the required Completion Time, the OPERABLE SCWS loop must be placed in operation immediately. This action ensures that the required cooling function is provided.

An alternative to Required Action C.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room. Required Action C.2 places the unit in a condition that minimizes accident risk. This does not preclude the movement of fuel to a safe position.

D.1

During movement of irradiated fuel assemblies, with two SCWS loops inoperable, action must be taken immediately to suspend activities that could result in a release of radioactivity that might require isolation of the control room.

This Action minimizes risk. This does not preclude the movement of fuel to a safe position.

E.1

If both SCWS loops are inoperable in MODE 1, 2, 3, or 4, the SCWS may not be capable of performing its intended function. Therefore, LCO 3.0.3 must be entered immediately.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.7.11.1

This SR verifies that each SCWS loop actuates on an actual or simulated safety injection actuation signal.

The 24 month Frequency on a STAGGERED TEST BASIS is appropriate since significant degradation of the SCWS is slow and is not expected over this time period.

SR 3.7.11.2

This SR verifies that necessary components in each SCWS loop operate as required.

The Frequency required by the Inservice Testing Program (Ref. 2) is appropriate since degradation of the SCWS could be detected in a timely manner for the components specified based on the known reliability of the components and the loop redundancy.

REFERENCES

1. USAR, Section 10.4.
2. Inservice Testing Program.

B 3.7 PLANT SYSTEMS

B 3.7.12 Auxiliary Building Special Ventilation System (ABSVS)

BASES

BACKGROUND

The ABSVS is a standby ventilation system, common to the two units, that is designed to collect and filter air from the Auxiliary Building Special Ventilation (ABSV) boundary following a loss of coolant accident (LOCA). The ABSV boundary contains those areas within the auxiliary building which have the potential for collecting significant containment leakage that could bypass the shield building and leakage from systems which could recirculate primary coolant during LOCA mitigation.

The ABSVS consists of two independent and redundant trains. Each train consists of a heater, a prefilter, a high efficiency particulate air (HEPA) filter, an activated charcoal adsorber section for removal of gaseous activity (principally iodines), and a fan.

Ductwork, dampers, and instrumentation also form part of the system. The system initiates filtered ventilation of the ABSV boundary following receipt of a safety injection (SI) signal, high radiation signal or manual initiation. The radiation signal is not credited in the USAR for accident mitigation.

The exhaust from the main condenser air ejector is directed to the ABSVS for filtering prior to exhausting from the plant via the shield building stack to mitigate steam generator tube leakage.

When the ABSVS actuates, the normal nonsafeguards supply and exhaust dampers close automatically, and the Auxiliary Building Normal Ventilation System supply and exhaust fans trip. The prefilters remove any large particles in the air, and with the heaters, reduce the level of entrained water droplets present, to prevent excessive loading of the HEPA filters and charcoal adsorbers. The primary purpose of the heaters is to maintain the relative humidity at an acceptable level.

BASES

BACKGROUND (continued)	The ABSVS would typically only be used for post accident atmospheric cleanup functions. The ABSVS and ABSV boundary are discussed in the USAR (References 1, 2 and 3).
APPLICABLE SAFETY ANALYSES	The design basis of the ABSVS is established by the large break LOCA. The potential leakage paths from the containment to the auxiliary building are discussed in Reference 1. The system evaluation assumes a passive failure of the ECCS outside containment, such as an RHR pump seal failure, during the recirculation mode (Ref. 4). In such a case, the system limits radioactive release to within the 10 CFR 100 (Ref. 5) limits. The analysis of the effects and consequences of a large break LOCA is presented in References 3 and 4. The ABSVS also actuates following a small break LOCA, in those cases where the ECCS goes into the recirculation mode of long term cooling, to clean up releases of smaller leaks, such as from valve stem packing. The ABSVS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).
LCO	Two independent and redundant trains of the ABSVS are required to be OPERABLE to ensure that at least one is available, assuming that a single failure disables the other train. This OPERABILITY requirement ensures that the atmospheric releases, in the event of a Design Basis Accident (DBA) in containment, from ECCS pump leakage and containment leakage which bypasses the shield building would not result in doses exceeding 10 CFR 100 limits (Ref. 5). In order for the ABSVS to be OPERABLE, the Turbine Building roof exhauster fans must be capable of being de-energized within 30 minutes following a loss of coolant accident.

BASES

LCO (continued)

An ABSVS train is considered OPERABLE when its associated:

a. Fan is OPERABLE;

b. HEPA filter and charcoal adsorbers are capable of passing their design flow and performing their filtration functions;

c. Heater, ductwork, and dampers are OPERABLE and air circulation can be maintained; and

d. Instrumentation and controls are OPERABLE.

The ABSV boundary is OPERABLE if both of the following conditions can be met:

a. Openings in the ABSV boundary are under direct administrative control and can be reduced to less than 10 square feet within 6 minutes following an accident; and

b. Dampers and actuation circuits that isolate the Auxiliary Building Normal Ventilation System following an accident are OPERABLE or can be manually isolated within 6 minutes following an accident.

The LCO is modified by a Note allowing the ABSV boundary to be opened under administrative controls. As discussed above, openings must be closed to less than 10 square feet within 6 minutes following an accident.

APPLICABILITY

In MODES 1, 2, 3, and 4 for either unit, the ABSVS is required to be OPERABLE.

When both units are in MODE 5 or 6, the ABSVS is not required to be OPERABLE.

BASES (continued)

ACTIONS

A.1

With one ABSVS train inoperable, action must be taken to restore OPERABLE status within 7 days. During this time, the remaining OPERABLE train is adequate to perform the ABSVS function.

The 7 day Completion Time is appropriate because the ABSVS risk contribution is substantially less than that for the ECCS (72 hour Completion Time). The 7 day Completion Time is based on the low probability of a DBA occurring during this time period, and ability of the remaining train to provide the required capability.

Concurrent failure of two ABSVS trains would result in the loss of functional capability; therefore, LCO 3.0.3 must be entered immediately.

B.1

With both ABSVS trains inoperable due to an inoperable ABSV boundary, action must be taken to restore OPERABLE status within 24 hours.

The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, and the availability of the ABSVS to provide a filtered release (albeit with potential for some unfiltered leakage).

If the ABSV boundary cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply.

BASES

ACTIONS (continued)

C.1 and C.2

If an ABSVS train cannot be restored to OPERABLE status or the ABSV boundary cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply.

To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.12.1

This SR verifies that each ABSVS train can be manually started, the associated filter heater energizes, and the filter units remain sufficiently dried out to ensure they can perform their function.

Standby systems should be checked periodically to ensure that they function properly. As the environment and normal operating conditions on this system are not severe, testing each train once a month provides an adequate check on this system. Monthly heater operations, with air circulation through the filter, dries out any moisture that may have accumulated in the charcoal from humidity in the ambient air. Each ABSVS train must be operated $\geq$ 10 hours per month with the heaters energized. The 31 day Frequency is based on the known reliability of equipment and the two train redundancy available.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.12.2

This SR verifies that the required ABSVS testing is performed in accordance with the Ventilation Filter Testing Program (VFTP).

The VFTP includes testing HEPA filter performance, charcoal adsorbers efficiency, minimum system flow rate, and the physical properties of the activated charcoal (general use and following specific operations).

Specific test Frequencies and additional information are discussed in detail in the VFTP.

SR 3.7.12.3

This SR verifies proper functioning of the ABSVS by verifying the integrity of the ABSV boundary and the ability of the ABSVS to maintain a negative pressure with respect to potentially uncontaminated adjacent areas.

During the post accident mode of operation, the ABSVS is designed to maintain a slight negative pressure within the ABSV boundary with respect to the containment and shield building.

Each ABSVS train is started from the control room and the following are verified:

a. Associated Auxiliary Building Normal Ventilation System fans trip and dampers close; and

b. A measurable negative pressure is drawn within the ABSV boundary within 6 minutes after initiation, with a 10 square foot opening within the ABSV boundary.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.12.3 (continued)

The 92 day Frequency is based on the known reliability of equipment and the two train redundancy available.

SR 3.7.12.4

The ABSVS initiates on a safety injection signal, high radiation signal or manual actuation. This SR verifies that each ABSVS train starts and operates on an actual or simulated safety injection actuation signal or on manual initiation.

The 24 month Frequency is consistent with industry reliability experience for similar equipment. The 24 month Frequency is acceptable since this system usually passes the Surveillance when performed.

REFERENCES

1. USAR, Appendix G.
2. USAR, Section 10.3.
3. USAR, Section 14.
4. USAR, Section 6.7.
5. 10 CFR 100.11.

B 3.7 PLANT SYSTEMS

B 3.7.13 Spent Fuel Pool Special Ventilation System (SFPSVS)

BASES

BACKGROUND

In this Specification, the spent fuel pool enclosure refers to the concrete building that contains the racks and storage pool used to store new and spent fuel.

SFPSVS refers to that portion of the Spent Fuel Special and Containment Inservice Purge system that provides the spent fuel pool enclosure air cleanup function.

The SFPSVS filters airborne radioactive particulates from the area of the spent fuel pool following a fuel handling accident in that area.

The Spent Fuel Pool Special Ventilation fans exhaust air to prefilter-absolute-charcoal (PAC) filters, then to the associated Shield Building vent stack (Unit 1 for Train A; Unit 2 for Train B).

The SFPSVS consists of two independent and redundant trains, each capable of meeting the design requirements.

Each train consists of a heater, a prefilter, a high efficiency particulate air (HEPA) filter, an activated charcoal adsorber section for removal of gaseous activity (principally iodines), and a fan.

Ductwork, dampers, and instrumentation also form part of the system. Heaters function to reduce the relative humidity of the airstream.

The system initiates filtered ventilation of the spent fuel pool enclosure following receipt of a high radiation signal from a radiation detector located in the exhaust ducting of the spent fuel pool normal ventilation system. One detector actuates Train A equipment; the other actuates Train B equipment.

BASES

BACKGROUND (continued)

The SFPSVS is a standby system. Upon receipt of the actuating signal, normal air supply to and discharge from the spent fuel pool ventilation system are isolated, and the stream of ventilation air discharges through the two SFPSVS filter trains. The prefilters remove any large particles in the air, and the heaters remove any entrained water droplets present, to prevent excessive loading of the HEPA filters and charcoal adsorbers. The SFPSVS is discussed in the USAR (Refs. 1, 2, and 3).

APPLICABLE SAFETY ANALYSES

The SFPSVS design basis is established by the consequences of the limiting Design Basis Accident (DBA), a fuel handling accident (FHA) in the spent fuel pool enclosure. LCO 3.9.4, "Containment Penetrations," separately addresses a fuel handling accident in containment.

The analysis of the fuel handling accident, given in Reference 3, assumes that all fuel rods in an assembly are damaged. The DBA analysis of the fuel handling accident assumes that only one train of the SFPSVS is functional due to a single failure that disables the other train. The accident analysis accounts for the reduction in airborne radioactive material provided by the one remaining train of this filtration system. The amount of fission products available for release from the spent fuel pool enclosure is determined for a fuel handling accident. These assumptions and the analysis follow the guidance provided in Regulatory Guide 1.25 (Ref. 4).

The SFPSVS satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Two independent and redundant trains of the SFPSVS are required to be OPERABLE to ensure that at least one train is available, assuming a single failure disables the other train. This OPERABILITY requirement ensures that the atmospheric release

BASES

LCO (continued)

from a fuel handling accident in the spent fuel pool enclosure would not result in doses exceeding the 10 CFR 100 limits.

The SFPSVS is considered OPERABLE when the individual components necessary to control offsite exposure are OPERABLE in both trains. An SFPSVS train is considered OPERABLE when its associated:

a. Fan is OPERABLE;

b. HEPA filter and charcoal adsorber are capable of passing their design flow and performing their filtration function;

c. Heater, ductwork, and dampers are OPERABLE;

d. Spent Fuel Pool Normal Ventilation train radiation monitor is OPERABLE; and

e. Spent Fuel Pool Normal Ventilation train is running.

Opening a personnel door for personnel ingress or egress does not make the SFPSVS boundary inoperable. Blocking the door open is not allowed (Ref. 5).

APPLICABILITY

During movement of irradiated fuel in the spent fuel pool enclosure, the SFPSVS is required to be OPERABLE to alleviate the consequences of a fuel handling accident.

ACTIONS

The ACTIONS table is modified by a Note stating LCO 3.0.3 is not applicable. LCO 3.0.3 is not applicable while in MODE 5 or 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify

BASES

ACTIONS (continued)

any action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operation. Entering LCO 3.0.3, while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

A.1

With one SFPSVS train inoperable, action must be taken to restore OPERABLE status within 7 days.

During this period, the remaining OPERABLE train is adequate to perform the SFPSVS function.

The 7 day Completion Time is based on the risk from an event occurring requiring the inoperable SFPSVS train, and the remaining SFPSVS train providing the required protection.

B.1 and B.2

When Required Action A.1 cannot be completed within the required Completion Time, during movement of irradiated fuel assemblies in the spent fuel pool enclosure, the OPERABLE SFPSVS train must be started immediately or fuel movement suspended. This is a reasonable action, based on engineering judgement, to assure that spent fuel pool enclosure releases are filtered in the event of an accident.

An alternative to Required Action B.1 is to immediately suspend activities that could result in a release of radioactivity. Required Action B.2 places the plant in a condition that minimizes risk. If the system is not placed in operation, this action requires suspension of fuel movement, which precludes a fuel handling accident. This does not preclude the movement of fuel assemblies to a safe position.

BASES

ACTIONS (continued)

C.1

When two trains of the SFPSVS are inoperable during movement of irradiated fuel assemblies in the spent fuel pool enclosure, action must be taken immediately to suspend movement of irradiated fuel assemblies in the spent fuel pool enclosure. This does not preclude the movement of fuel to a safe position.

SURVEILLANCE REQUIREMENTS

SR 3.7.13.1

This SR verifies that each SFPSVS train can be started, and that the associated filter units and heaters can perform their function.

Standby systems should be checked periodically to ensure that they function properly. As the environmental and normal operating conditions on this system are not severe, testing each train once every month provides an adequate check on this system.

Monthly heater operation dries out any moisture accumulated in the charcoal from humidity in the ambient air. Each SFPSVS train must be operated with heaters energized for $\geq$ 10 hours. The 31 day Frequency is based on the known reliability of the equipment and the two train redundancy available.

SR 3.7.13.2

This SR verifies that the required SFPSVS testing is performed in accordance with the Ventilation Filter Testing Program (VFTP).

The VFTP includes testing HEPA filter performance, charcoal adsorber efficiency, minimum system flow rate, and the physical properties of the activated charcoal (general use and following specific operations).

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.13.2 (continued)

Specific test frequencies and additional information are discussed in detail in the VFTP.

SR 3.7.13.3

This SR verifies that each SFPSVS train starts and operates on an actual or simulated radiation monitor actuation signal.

The 24 month Frequency is consistent with the VFTP.

SR 3.7.13.4

This SR verifies the ability of the SFPSVS fan to maintain the design flow rate of 5200 ± 10% cfm.

A 24 month Frequency (on a STAGGERED TEST BASIS) is consistent with industry reliability experience for similar equipment. The 24 month Frequency on a STAGGERED TEST BASIS is acceptable since this system usually passes the Surveillance when performed.

REFERENCES

1. USAR, Section 7.5.
2. USAR, Section 10.3.
3. USAR, Section 14.5.
4. Regulatory Guide 1.25.
5. NSP Prairie Island Safety Evaluation 50-475, "Spent Fuel Pool Personnel Access Doors".

B 3.7 PLANT SYSTEMS

B 3.7.14 Secondary Specific Activity

BASES

BACKGROUND

Activity in the secondary coolant results from steam generator tube outleakage from the Reactor Coolant System (RCS). Under steady state conditions, the activity is primarily iodines with relatively short half lives and, thus, indicates current conditions. During transients, I-131 spikes have been observed as well as increased releases of some noble gases. Other fission product isotopes, as well as activated corrosion products in lesser amounts, may also be found in the secondary coolant.

A limit on secondary coolant specific activity during power operation minimizes releases to the environment during normal operation, anticipated operational occurrences, and accidents.

This limit is lower than the activity value that might be expected from a 150 gpd tube leak (LCO 3.4.14, "RCS Operational LEAKAGE") of primary coolant at the limit of 1.0 μCi/gm (LCO 3.4.17, "RCS Specific Activity"). The steam line failure is assumed to result in the release of the noble gas and iodine activity contained in the steam generator inventory, the feedwater, and the reactor coolant LEAKAGE. Most of the iodine isotopes have short half lives, (i.e., < 20 hours).

Limiting secondary specific activity also reduces site and exclusion area boundary (EAB) exposures in the event of a steam generator tube rupture (Ref. 1).

APPLICABLE SAFETY ANALYSES

The accident analysis of the main steam line break (MSLB) outside of containment, as discussed in the USAR (Ref. 1) and NSP License Amendment Request correspondence (Ref. 2), assumes the initial secondary coolant specific activity to have a radioactive isotope

BASES

APPLICABLE SAFETY ANALYSES (continued)	concentration of 0.10 μCi/gm DOSE EQUIVALENT I-131. This assumption is used in the analysis for determining the radiological consequences of the postulated accident. The accident analysis, based on this and other assumptions, shows that the radiological consequences of a MSLB do not exceed a small fraction of the unit EAB limits of 10 CFR 100.11 for whole body and thyroid dose rates. With the loss of offsite power, the remaining steam generator is available for core decay heat dissipation by venting steam to the atmosphere through the main steam safety valves (MSSVs) and steam generator power operated relief valve (SG PORV). The Auxiliary Feedwater System supplies the necessary makeup to the steam generators. Venting continues until the reactor coolant temperature and pressure have decreased sufficiently for the Residual Heat Removal System to complete the cooldown. In the evaluation of the radiological consequences of this accident, the activity released from the steam generator connected to the failed steam line is assumed to be released directly to the environment. The unaffected steam generator is assumed to discharge steam and any entrained activity through the MSSVs and SG PORV during the event. Since no credit is taken in the analysis for activity plateout or retention, the resultant radiological consequences represent a conservative estimate of the potential integrated dose due to the postulated steam line failure. With the specified activity limit, the resultant 2 hour thyroid dose to a person at the EAB would be a very small fraction of Reference 3 requirements if the MSSVs open for 2 hours following a trip from full power. Secondary specific activity limits satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).

BASES (continued)

LCO	As indicated in the Applicable Safety Analyses, the specific activity of the secondary coolant is required to be ≤ 0.10 μCi/gm DOSE EQUIVALENT I-131 to limit the radiological consequences of a Design Basis Accident (DBA) to a small fraction of the required limit (Ref. 3). Monitoring the specific activity of the secondary coolant ensures that when secondary specific activity limits are exceeded, appropriate actions are taken in a timely manner to place the unit in an operational MODE that would minimize the radiological consequences of a DBA.
APPLICABILITY	In MODES 1, 2, 3, and 4, the limits on secondary specific activity apply due to the potential for secondary steam releases to the atmosphere. In MODES 5 and 6, the steam generators are not being used for heat removal. Both the RCS and steam generators are depressurized, and primary to secondary LEAKAGE is minimal. Therefore, monitoring of secondary specific activity is not required.
ACTIONS	<u>A.1 and A.2</u> DOSE EQUIVALENT I-131 exceeding the allowable value in the secondary coolant, is an indication of a problem in the RCS and contributes to increased post accident doses. If the secondary specific activity cannot be restored to within limits within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within36 hours.

BASES

ACTIONS

A.1 and A.2 (continued)

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.14.1

This SR verifies that the secondary specific activity is within the limits of the accident analysis. A gamma isotopic analysis of the secondary coolant, which determines DOSE EQUIVALENT I-131, confirms the validity of the safety analysis assumptions as to the source terms in post accident releases. It also serves to identify and trend any unusual isotopic concentrations that might indicate changes in reactor coolant activity or LEAKAGE.

The 31 day Frequency is based on the detection of increasing trends of the level of DOSE EQUIVALENT I-131, and allows for appropriate action to be taken to maintain levels below the LCO limit.

REFERENCES

1. USAR, Section 14.5.

2. Letter entitled "Response to Request for Additional Information Related to License Amendment Request Dated May 15, 1997 Incorporation of Voltage-Based Steam Generator Tube Repair Criteria (TAC Nos. M98944 and M98945)", Joel P. Sorensen (NSP) to US Nuclear Regulatory Commission, dated October 20, 1997.

3. 10 CFR 100.11.

B 3.7 PLANT SYSTEMS

B 3.7.15 Spent Fuel Storage Pool Water Level

BASES

BACKGROUND

The minimum water level in the spent fuel storage pool meets the assumptions of iodine decontamination factors following a fuel handling accident. The specified water level shields and minimizes the general area dose when the storage racks are filled to their maximum capacity. The water also provides shielding during the movement of spent fuel.

A general description of the spent fuel storage pool design and a description of the Spent Fuel Pool Cooling and Cleanup System is given in the USAR (Ref. 1). The assumptions of the fuel handling accident are given in Reference 2.

APPLICABLE SAFETY ANALYSES

The minimum water level in the spent fuel storage pool meets the assumptions of the fuel handling accident described in Regulatory Guide 1.25 (Ref. 3). The resultant 2 hour thyroid dose per person at the exclusion area boundary is a small fraction of the 10 CFR 100.11 limits.

According to Reference 3, there is 23 ft of water between the top of the damaged fuel bundle and the fuel pool surface during a fuel handling accident. With 23 ft of water, the assumptions of Reference 3 can be used directly. In practice, this LCO preserves this assumption for the bulk of the fuel in the storage racks. In the case of a single bundle dropped and lying horizontally on top of the spent fuel racks, however, there may be < 23 ft of water above the top of the fuel bundle and the surface, indicated by the width of the bundle. To offset this small nonconservatism, the analysis assumes that all fuel rods fail, although analysis shows that only the first few

BASES

APPLICABLE SAFETY ANALYSES (continued)	rows fail from a hypothetical maximum drop. The Fuel Handling Accident is discussed in Reference 2. The spent fuel storage pool water level satisfies Criteria 2 and 3 of 10 CFR 50.36(c)(2)(ii).
LCO	The spent fuel storage pool water level is required to be ≥ 23 ft over the top of irradiated fuel assemblies seated in the storage racks. The specified water level preserves the assumptions of the fuel handling accident analysis (Ref. 2). As such, it is the minimum required for spent fuel movement within the spent fuel storage pool.
APPLICABILITY	This LCO applies during movement of irradiated fuel assemblies in the spent fuel storage pool, since the potential for a release of fission products exists.
ACTIONS	<u>A.1</u> Required Action A.1 is modified by a Note indicating that LCO 3.0.3 does not apply. When the initial conditions for prevention of an accident cannot be met, steps should be taken to preclude the accident from occurring. When the spent fuel storage pool water level is lower than the required level, the movement of irradiated fuel assemblies in the spent fuel storage pool is immediately suspended. This action effectively precludes the occurrence of a fuel handling accident. This does not preclude movement of a fuel assembly to a safe position. If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving irradiated fuel

BASES

ACTIONS

A.1 (continued)

assemblies while in MODES 1, 2, 3, and 4, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.7.15.1

This SR verifies sufficient spent fuel storage pool water is available in the event of a fuel handling accident. The water level in the spent fuel storage pool must be checked periodically. The 7 day Frequency is appropriate because the volume in the pool is normally stable. Water level changes are controlled by plant procedures and are acceptable based on operating experience.

During refueling operations, the level in the spent fuel storage pool is in equilibrium with the refueling cavity, and the level in the refueling cavity is checked daily in accordance with SR 3.9.2.1.

REFERENCES

1. USAR, Section 10.2.

2. USAR, Section 14.5.

3. Regulatory Guide 1.25, Rev. 0.

B 3.7 PLANT SYSTEMS

B 3.7.16 Spent Fuel Storage Pool Boron Concentration

BASES

BACKGROUND

The spent fuel storage pool is a two compartment pool as described in Reference 1. These 2 compartments are referred to as Pool 1 and Pool 2. Pool 1 has up to 462 storage positions. Pool 2 has up to 1120 storage positions.

Either pool is designed to accommodate fuel of various initial enrichments (up to 5 weight percent (w/o)) which have accumulated minimum burnups and decay times within the unrestricted domain according to the applicable Figure 3.7.17-1 (OFA design) or Figure 3.7.17-2 (STD design), in the accompanying LCO. Fuel assemblies not meeting the criteria of the applicable Figure 3.7.17-1 or Figure 3.7.17-2 shall be stored in accordance with paragraph 4.3.1.1 in Technical Specifications Section 4.3, Fuel Storage.

The water in the spent fuel storage pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 1.00 be evaluated in the absence of soluble boron. The double contingency principle discussed in Reference 2 and the April 1978 NRC letter (Ref. 3) allows credit for additional soluble boron under other abnormal or accident conditions, since only a single accident need be considered at one time. Safe operation of the spent fuel pool may therefore be achieved by controlling the location of each assembly in accordance with LCO 3.7.17, "Spent Fuel Pool Storage" and by maintaining boron concentration in accordance with this LCO.

BASES (continued)

APPLICABLE SAFETY ANALYSES

Most accident conditions in the spent fuel pool will not result in an increase in k_{eff} of the racks. Examples of those accident conditions which will not result in an increase in k_{eff} are a fuel assembly drop on the top of the racks, a fuel assembly drop between rack modules and wall (rack design precludes this condition), and a drop or placement of a fuel assembly into the cask loading area of the small pool. However, two accidents can be postulated which could increase reactivity. The first postulated accident would be a loss of the spent fuel pool cooling system and the second would be a misload of a fuel assembly into a cell for which the restrictions on location, enrichment, burnup, decay time or gadolinium credit are not satisfied. For an occurrence of these postulated accident conditions, the double contingency principle of Reference 2 can be applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Thus, for these postulated accident conditions, the presence of additional soluble boron in the spent fuel pool water (above the 750 ppm required to maintain k_{eff} less than 0.95 under normal conditions) can be assumed as a realistic initial condition since not assuming its presence would be a second unlikely event.

Calculations were performed (Ref. 4) to determine the amount of soluble boron required to offset the highest reactivity increase caused by either of these postulated accidents and to maintain k_{eff} less than or equal to 0.95. It was found that a spent fuel pool boron concentration of 1300 ppm was adequate to mitigate these postulated criticality related accidents and to maintain k_{eff} less than or equal to 0.95. This specification ensures the spent fuel pool contains adequate dissolved boron to compensate for the increased reactivity caused by a mispositioned fuel assembly or a loss of spent fuel pool cooling. The 1800 ppm spent fuel pool boron concentration limit in this specification was chosen to be consistent with the boron concentration limit required for a spent fuel cask containing fuel. The 1800 ppm limit will ensure that k_{eff} for the

BASES

APPLICABLE SAFETY ANALYSES (continued)	spent fuel cask, including statistical probabilities, will be less than or equal to 0.95 for all postulated arrangements of fuel within the cask. Technical Specifications Section 4.3 requires that the spent fuel rack k_{eff} be less than or equal to 0.95 when flooded with water borated to 750 ppm. A spent fuel pool boron dilution analysis was performed which confirmed that sufficient time is available to detect and mitigate a dilution of the spent fuel pool before the 0.95 k_{eff} design basis is exceeded. The spent fuel pool boron dilution analysis concluded that an unplanned or inadvertent event which could result in the dilution of the spent fuel pool boron concentration from 1800 ppm to 750 ppm is not a credible event. The concentration of dissolved boron in the fuel storage pool satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).
LCO	The fuel storage pool boron concentration is required to be ≥ 1800 ppm. The specified concentration of dissolved boron in the fuel storage pool preserves the assumptions used in the analyses of the potential critical accident scenarios as described in References 4 and 5. This concentration of dissolved boron is the minimum required concentration for fuel assembly storage, movement within the fuel storage pool, and for loading and unloading a spent fuel storage cask.
APPLICABILITY	This LCO applies whenever fuel assemblies are stored in the spent fuel storage pool.
ACTIONS	<u>A.1 and A.2</u> The Required Actions are modified by a Note indicating that LCO 3.0.3 does not apply.

BASES

ACTIONS

A.1 and A.2 (continued)

When the concentration of boron in the spent fuel storage pool is less than required, immediate action must be taken to preclude the occurrence of an accident or to mitigate the consequences of an accident in progress. This is most efficiently achieved by immediately suspending the movement of fuel assemblies. The concentration of boron is restored simultaneously with suspending movement of fuel assemblies. This does not preclude movement of a fuel assembly to a safe position.

If the LCO is not met while moving irradiated fuel assemblies in MODE 5 or 6, LCO 3.0.3 would not be applicable. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operation. Therefore, inability to suspend movement of fuel assemblies is not sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.7.16.1

This SR verifies that the concentration of boron in the spent fuel storage pool is within the required limit. As long as this SR is met, the analyzed accidents are fully addressed. The 7 day Frequency is appropriate because no major replenishment of pool water is expected to take place over such a short period of time.

REFERENCES

1. USAR, Section 10.2.

2. ANSI/ANS-8.1-1983.

3. Nuclear Regulatory Commission, Letter to All Power Reactor Licensees from B. k. Grimes, "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications", April 14, 1978.

BASES

REFERENCES (continued)

4. "Northern States Power Prairie Island Units 1 and 2 Spent Fuel Rack Criticality Analysis Using Soluble Boron Credit", Westinghouse Commercial Nuclear Fuel Division, February 1997.

5. USAR, Section 14.5.

B 3.7 PLANT SYSTEMS

B 3.7.17 Spent Fuel Pool Storage

BASES

BACKGROUND

The spent fuel storage pool is a two compartment pool as described in the USAR (Ref. 1). These 2 compartments are referred to as Pool 1 and Pool 2. Fuel stored in the Prairie Island fuel storage pools include fuel with the:

a. OFA designation, which includes the Westinghouse OFA and Vantage Plus designs; and

b. STD designation, which includes the Westinghouse Standard and Exxon fuel designs.

Criticality considerations provide the primary basis for storage limitations.

Pool 1 may contain up to 462 storage positions, except when the pool is used for cask laydown. In the latter case, only 266 storage positions are available since 4 storage racks must be removed to accommodate the storage cask. Pool 2 has up to 1120 storage positions.

Pools 1 and 2 are designed to accommodate fuel of various initial enrichments (up to 5 weight percent (w/o)), which have accumulated minimum burnups and decay times within the unrestricted domain according to the applicable Figure 3.7.17-1 (OFA Fuel) or Figure 3.7.17-2 (STD Fuel), in the accompanying LCO.

Fuel assemblies not meeting the criteria of the applicable Figure 3.7.17-1 or Figure 3.7.17-2 shall be stored in accordance with paragraph 4.3.1.1 in Section 4.3, Fuel Storage.

BASES

BACKGROUND (continued)

The water in the spent fuel storage pool normally contains soluble boron, which results in large subcriticality margins under actual operating conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 1.00 be evaluated in the absence of soluble boron. The double contingency principle discussed in Reference 2 and the April 1978 NRC letter (Ref. 3) allows credit for additional soluble boron under other abnormal or accident conditions, since only a single accident need be considered at one time. To mitigate postulated criticality related accidents, boron is dissolved in the pool water. Safe operation of the spent fuel pool may therefore be achieved by controlling the location of each assembly in accordance with the accompanying LCO and maintaining boron concentration in accordance with LCO 3.7.16.

APPLICABLE SAFETY ANALYSES

The hypothetical criticality accidents can only take place during or as a result of the movement of an assembly (Ref. 4). For these accident occurrences, the presence of soluble boron in the spent fuel storage pool (controlled by LCO 3.7.16, "Fuel Storage Pool Boron Concentration") prevents criticality. By closely controlling the movement of each assembly and by verifying the appropriate checkerboarding after each fuel handling campaign, the time period for potential accidents may be limited to a small fraction of the total operating time. During the remaining time period with no potential for criticality accidents, the operation may be under the auspices of the accompanying LCO.

The spent fuel storage racks have been analyzed in accordance with the methodology contained in Reference 5. That methodology ensures that the spent fuel rack multiplication factor, k_{eff}, is less than 0.95 as recommended by ANSI 57.2-1983 (Ref. 6) and NRC guidance (Ref. 3). The codes, methods and techniques contained in the methodology are used to satisfy this criterion on k_{eff}. The resulting Prairie Island spent fuel rack criticality analysis allows for the storage of fuel assemblies with enrichments up to a maximum

BASES

APPLICABLE SAFETY ANALYSES (continued)

of 5.0 weight percent U-235 while maintaining $k_{eff} \leq 0.95$ including uncertainties and credit for soluble boron. In addition, sub-criticality of the pool ($k_{eff} < 1.0$) is assured on a 95/95 basis, without the presence of the soluble boron in the pool. Credit is taken for radioactive decay time of the spent fuel and for the presence of fuel rods containing gadolinium burnable poison.

The criticality analysis (Ref. 7) utilized the following storage configurations to ensure that the spent fuel pool will remain subcritical during the storage of fuel assemblies with all possible combinations of burnup and initial enrichment:

a. The first storage configuration utilizes a checkerboard loading pattern to accommodate new or low burnup fuel with a maximum enrichment of 5.0 w/o U-235. This configuration stores "burned" and "fresh" fuel assemblies in a 3x3 checkerboard pattern as shown in Figure 4.3-1. Fuel assemblies stored in "burned" cell locations are selected based on a combination of fuel assembly type, initial enrichment, discharge burnup and decay time (Figures 4.3-3 through 4.3-12). The criteria for the fuel stored in the "burned" locations is also dependent on the number of rods containing gadolinium in the center "fresh" fuel assembly. The use of empty cells is also an acceptable option for the "burned" cell locations. This will allow the storage of new or low burnup fuel assemblies in the outer rows of the spent fuel storage racks because the area outside the racks can be considered to be empty cells.

   Fuel assemblies that fall into the restricted range of Figures 3.7.17-1 or 3.7.17-2 are required to be stored in "fresh" cell locations as shown in Figure 4.3-1. The criteria included in Figures 3.7.17-1 and 3.7.17-2 for the selection of fuel assemblies to be stored in the "fresh" cell locations is based on a combination of fuel assembly type, initial enrichment, decay time and discharge burnup.

BASES

APPLICABLE SAFETY ANALYSES (continued)

b. The second storage configuration does not utilize any special loading pattern. Fuel assemblies with burnup, initial enrichment and decay time which fall into the unrestricted range of Figures 3.7.17-1 or 3.7.17-2, as applicable, can be stored anywhere in the region with no special placement restrictions.

The burned/fresh fuel checkerboard region can be positioned anywhere within the spent fuel racks, but the boundary between the checkerboard region and the unrestricted region must be either:

a. Separated by a vacant row of cells; or

b. The interface must be configured such that there is one row carryover of the pattern of burned assemblies from the checkerboard region into the first row of the unrestricted region (Figure 4.3-2).

Specification 3.7.17 and Section 4.3 ensure that fuel is stored in the spent fuel racks in accordance with the storage configurations assumed in the spent fuel rack criticality analysis (Ref. 7).

The spent fuel pool criticality analysis addresses all the fuel types currently stored in the spent fuel pool and in use in the reactor. The fuel types considered in the analysis include the Westinghouse Standard (STD), OFA, and Vantage Plus designs, and the Exxon fuel assembly types in storage in the spent fuel pool. The OFA designation on the figures in Specification 3.7.17 and Section 4.3 bound all of the Westinghouse OFA and Vantage Plus fuel assemblies at Prairie Island. The STD designation on the figures in Specification 3.7.17 and Section 4.3 bound all of the Westinghouse STD and Exxon fuel assemblies at Prairie Island.

Most accident conditions in the spent fuel pool will not result in an increase in k_{eff} of the racks. Examples of those accident conditions

BASES

APPLICABLE SAFETY ANALYSES (continued)

which will not result in an increase in k_{eff} are:

a. A fuel assembly drop on the top of the racks;

b. A fuel assembly drop between rack modules and wall (rack design precludes this condition); and

c. A drop or placement of a fuel assembly into the cask loading area of the small pool.

However, two accidents can be postulated which could increase reactivity. The first postulated accident would be a loss of the spent fuel pool cooling system and the second would be a misload of a fuel assembly into a cell for which the restrictions on location, enrichment, burnup, decay time or gadolinium credit are not satisfied.

For an occurrence of these postulated accident conditions, the double contingency principle of Reference 2 can be applied. This states that one is not required to assume two unlikely, independent, concurrent events to ensure protection against a criticality accident. Thus, for these postulated accident conditions, the presence of additional soluble boron in the spent fuel pool water (above the 750 ppm required to maintain k_{eff} less than 0.95 under normal conditions) can be assumed as a realistic initial condition since not assuming its presence would be a second unlikely event.

Westinghouse Commercial Nuclear Fuel Division calculations (Ref. 7) were performed to determine the amount of soluble boron required to offset the highest reactivity increase caused by either of these postulated accidents and to maintain k_{eff} less than or equal to 0.95. It was found that a spent fuel pool boron concentration of 1300 ppm was adequate to mitigate these postulated criticality related accidents and to maintain k_{eff} less than or equal to 0.95.

Specification 3.7.16 ensures the spent fuel pool contains adequate dissolved boron to compensate for the increased reactivity caused by

BASES

APPLICABLE SAFETY ANALYSES (continued)

a mispositioned fuel assembly or a loss of spent fuel pool cooling. The 1800 ppm spent fuel pool boron concentration limit in Specification 3.7.16 is consistent with the boron concentration limit required for a spent fuel cask containing fuel.

Section 4.3 requires that the spent fuel rack k_{eff} be less than or equal to 0.95 when flooded with water borated to 750 ppm. A spent fuel pool boron dilution analysis was performed which confirmed that sufficient time is available to detect and mitigate a dilution of the spent fuel pool before the 0.95 k_{eff} design basis is exceeded. The spent fuel pool boron dilution analysis concluded that an unplanned or inadvertent event which could result in the dilution of the spent fuel pool boron concentration from 1800 ppm to 750 ppm is not a credible event.

When the requirements of Specification 3.7.17 are not met, immediate action must be taken to move any noncomplying fuel assembly to an acceptable location to preserve the double contingency principle assumption of the criticality accident analysis.

The configuration of fuel assemblies in the fuel storage pool satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The restrictions on the placement of fuel assemblies within the spent fuel pool, in accordance with the applicable Figure 3.7.17-1 (OFA Fuel) or Figure 3.7.17-2 (STD Fuel), in the accompanying LCO, ensure the k_{eff} of the spent fuel storage pool will always remain < 0.95, with credit given for boron in the water.

Fuel assemblies not meeting the criteria of the appropriate Figure 3.7.17-1 or Figure 3.7.17-2 shall be stored in accordance with Specification 4.3.1.1 in Section 4.3.

BASES (continued)

APPLICABILITY	This LCO applies whenever any fuel assembly is stored in the spent fuel storage pool.

ACTIONS

A.1

Required Action A.1 is modified by a Note indicating that LCO 3.0.3 does not apply.

When the configuration of fuel assemblies stored in the spent fuel storage pool is not in accordance with the applicable Figure 3.7.17-1 or Figure 3.7.17-2, or paragraph 4.3.1.1, the immediate action is to initiate action to make the necessary fuel assembly movement(s) to bring the configuration into compliance with the applicable Figure 3.7.17-1 or Figure 3.7.17-2 or Specification 4.3.1.1.

If unable to move irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not be applicable. If unable to move irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the action is independent of reactor operation. Therefore, inability to move fuel assemblies is not sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.7.17.1

This SR verifies by administrative means that the initial enrichment and burnup of the fuel assembly is in accordance with the applicable Figure 3.7.17-1 or Figure 3.7.17-2 in the accompanying LCO. For fuel assemblies in the restricted range of the applicable Figure 3.7.17-1 or Figure 3.7.17-2, performance of this SR will ensure compliance with Specification 4.3.1.1.

The Frequency of this SR is prior to storing or moving a fuel assembly.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.17.2

This SR verifies that the fuel assemblies in the spent fuel storage racks are stored in accordance with the requirements of LCO 3.7.17 and Section 4.3.1.1.

The intent of this SR is to not require completion of the spent fuel pool inventory verification during interruptions in fuel handling during a defined fuel handling campaign. No spent fuel pool inventory verification is required following fuel movements where no fuel assemblies are relocated to different spent fuel rack locations.

The Frequency of this SR requires performance within 7 days after the completion of any fuel handling campaign which involves:

a. The relocation of fuel assemblies within the spent fuel pool; or

b. The addition of fuel assemblies to the spent fuel pool.

The extent of a fuel handling campaign will be defined by plant administrative procedures. Examples of a fuel handling campaign would include all the fuel handling performed during a refueling outage or associated with the placement of new fuel into the spent fuel pool.

The 7 day allowance for completion of this SR provides adequate time for completion of the spent fuel pool inventory verification while minimizing the time a fuel assembly may be misloaded in the spent fuel pool. If a fuel assembly is misloaded during the fuel handling campaign, the minimum boron concentration required by LCO 3.7.16 will ensure that the spent fuel rack k_{eff} remains within limits until the spent fuel inventory verification is performed.

BASES (continued)

REFERENCES

1. USAR, Section 10.2.

2. ANSI/ANS-8.1-1983.

3. Nuclear Regulatory Commission, Letter to All Power Reactor Licensees from B. K. Grimes, "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications", April 14, 1978.

4. "Criticality Analysis of the Prairie Island Units 1 & 2 Fresh and Spent Fuel Racks", Westinghouse Commercial Nuclear Fuel Division, February 1993.

5. WCAP-14416-NP-A, "Westinghouse Spent Fuel Rack Criticality Analysis Methodology", Revision 1, November 1996.

6. American Nuclear Society, "American National Standard Design Requirements for Light Water Reactor Fuel Storage Facilities at Nuclear Power Plants", ANSI/ANS-57.2-1983, October 7, 1983.

7. "Northern States Power Prairie Island Units 1 and 2 Spent Fuel Rack Criticality Analysis Using Soluble Boron Credit", Westinghouse Commercial Nuclear Fuel Division, February 1997.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.1 AC Sources-Operating

BASES

BACKGROUND

The unit 4 kV Safeguards Distribution System AC sources consist of the offsite power sources and the onsite standby power sources (Train A and Train B diesel generators (DGs)). As required by AEC GDC Criterion 39 (Ref. 1), the design of the AC electrical power system provides independence and redundancy to ensure an available source of power to the Engineered Safety Feature (ESF) systems.

The onsite Safeguards AC Distribution System is divided into redundant trains so that the loss of any one train does not prevent the minimum safety functions from being performed. Each train has two connections to the offsite power sources, and one to an onsite DG.

Offsite power is supplied to the unit switchyard(s) from the transmission network by five transmission lines. From the switchyard(s), electrically and physically separated paths provide AC power, through step down station auxiliary transformers, to the 4 kV safeguards buses. A detailed description of the offsite power network and the paths to the safeguards buses is found in Reference 2.

A path consists of all breakers, transformers, switches, cabling, and controls required to transmit power from the offsite transmission network to the safeguards bus(es).

Certain required unit loads are returned to service in a predetermined sequence in order to prevent overloading the transformer supplying offsite power to the onsite Safeguards AC Distribution System under postulated worst case loading conditions. Within 1 minute after the load restore signal is received, all loads needed to recover the unit or maintain it in a safe condition are returned to service via the load

BASES

BACKGROUND (continued)

sequencer. The transformers are capable of block loading (operation without load sequencing), when loading and motor starting is selectively restricted. Refer to Specification 3.3.4, "4kV Safeguards Bus Voltage Instrumentation" for additional actions prescribed for an inoperable load sequencer.

The onsite standby power source for each 4kV safeguards bus is a dedicated DG. For Unit 1, DGs 1 and 2 are dedicated to buses 15 and 16, respectively. For Unit 2, DGs 5 and 6 are dedicated to buses 25 and 26, respectively. A DG starts automatically on a safety injection (SI) signal (e.g., low pressurizer pressure or high containment pressure signals) or on a 4 kV safeguards bus degraded voltage or undervoltage signal (refer to LCO 3.3.4, "4 kV Safeguards Bus Voltage Instrumentation"). After the DG has started, it will automatically tie to its respective bus after offsite power is tripped as a consequence of safeguards bus undervoltage or degraded voltage, independent of or coincident with an SI signal. The DGs will also start and operate in the standby mode without tying to the safeguards bus on an SI signal alone. Following the trip of offsite power, a sequencer strips nonpermanent loads from the bus. When the DG is tied to the bus, loads are then sequentially connected to its respective bus by the automatic load sequencer. The sequencing logic controls the start permissive for motor breakers to prevent overloading the DG by automatic load application.

In the event of a loss of offsite power, the safeguards electrical loads are automatically connected to the DGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA) such as a loss of coolant accident (LOCA).

Certain required unit loads are returned to service in a predetermined sequence in order to prevent overloading the DG in the process. Within 1 minute after the load restore signal is received, all loads needed to recover the unit or maintain it in a safe condition are returned to service.

BASES

BACKGROUND (continued)

Ratings for the Unit 1 DGs meet the intent of Safety Guide 9 and Unit 2 DGs satisfy the intent of Regulatory Guide 1.9, as discussed in the USAR (Ref. 2). The continuous service rating of each Unit 1 DG is 2750 kW with a 30 minute rating of 3250 kW. The continuous service rating of each Unit 2 DG is 5400 kW with 10% overload permissible for up to 2 hours in any 24 hour period. The safeguards loads that are powered from the 4 kV safeguards buses are listed in Reference 2.

APPLICABLE SAFETY ANALYSES

The initial conditions of DBA and transient analyses in the USAR (Ref. 3) assume ESF systems are OPERABLE. The AC electrical power sources are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System (RCS), and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the AC electrical power sources is consistent with the initial assumptions of the Accident analyses and is based upon meeting the design basis of the unit. This results in maintaining at least one train of the onsite or offsite AC sources OPERABLE during Accident conditions in the event of:

a. An assumed loss of all offsite power; and

b. A worst case single failure.

The AC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES (continued)

LCO

Two paths between the offsite transmission grid and the onsite 4 kV Safeguards Distribution System and separate and independent DGs for each train ensure availability of the required power to shut down the reactor and maintain it in a safe shutdown condition after an anticipated operational occurrence (AOO) or a postulated DBA.

The paths are described in the USAR and are part of the licensing basis for the unit. There are four separate external power sources which provide multiple offsite network connections:

a. A reserve transformer (1R) from the 161 kV portion of the plant substation;

b. A second reserve transformer (2RS/2RY) from the 345 kV portion of the plant substation;

c. A cooling tower transformer (CT1/CT11) supplied from the 345 kV portion of the plant substation; and

d. A cooling tower transformer (CT12) supplied from a tertiary winding on the substation auto transformer.

Each path must be capable of maintaining rated frequency and voltage, and accepting required loads during an accident, while connected to the safeguards buses. Plant procedures provide an assessment for the various configurations and requirements (e.g., loading, grid conditions, generator MVAR load, and etc.) for a path to be declared OPERABLE.

Each DG must be capable of starting, accelerating to required speed and voltage, and connecting to its respective safeguards bus on detection of bus undervoltage. The DG will be ready to load within 10 seconds following receipt of a start signal. Each DG must also be capable of accepting required loads within the assumed loading

BASES

LCO (continued)

sequence intervals, and continue to operate until offsite power can be restored to the safeguards buses. These capabilities are required to be met from a variety of initial conditions such as DG in standby with the engine hot and DG in standby with the engine at ambient conditions.

Proper sequencing of loads is a required function for DG OPERABILITY.

APPLICABILITY

The AC sources are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs; and

b. Adequate core cooling is provided and containmen OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

The AC power requirements for MODES 5 and 6 are covered in LCO 3.8.2, "AC Sources-Shutdown."

The Load Sequencer requirements are covered in LCO 3.3.4, "4 kV Safeguards Bus Voltage Instrumentation".

BASES (continued)

ACTIONS

A.1

To ensure a highly reliable power source remains with one path inoperable, it is necessary to verify the OPERABILITY of the remaining path on a more frequent basis. Since the Required Action only specifies "perform," a failure of SR 3.8.1.1 acceptance criteria does not result in a Required Action not met. However, if the second path fails SR 3.8.1.1, there are no OPERABLE paths, and Condition C, for two paths inoperable, is entered.

A. 2

Operation may continue in Condition A for a period that should not exceed 7 days. With one path inoperable, the reliability of the offsite system is degraded, and the potential for a loss of offsite power is increased, with attendant potential for a challenge to the unit safety systems. In this Condition, however, the remaining OPERABLE path and DGs are adequate to supply electrical power to the onsite Safeguards Distribution System.

The 7 day Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action A.2 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, a DG is inoperable and that DG is subsequently returned OPERABLE, the LCO may already have been not met for up to 7 days. This could lead to a total of 14 days, since initial failure to meet the LCO, to restore the offsite circuit. At this time, a

BASES

ACTIONS

A. 2 (continued)

DG could again become inoperable, the circuit restored OPERABLE, and an additional 7 days (for a total of 21 days) allowed prior to complete restoration of the LCO. The 14 day Completion Time provides a limit on the time allowed in a specified condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions A and B are entered concurrently. The "AND" connector between the 7 day and 14 day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

The Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time that the LCO was initially not met, instead of at the time Condition A was entered.

B.1

To ensure a highly reliable power source remains with an inoperable DG, it is necessary to verify the availability of the paths on a more frequent basis. Since the Required Action only specifies "perform," a failure of SR 3.8.1.1 acceptance criteria does not result in a Required Action being not met. However, if a path fails to pass SR 3.8.1.1, it is inoperable and additional Conditions and Required Actions apply.

BASES

ACTIONS (continued)

B.2

Required Action B.2 is intended to provide assurance that a loss of offsite power, during the period that a DG is inoperable, does not result in a complete loss of safety function of critical systems. These features are designed with redundant safety related trains. Redundant required feature failures consist of inoperable features associated with a train, redundant to the train that has an inoperable DG.

The Completion Time for Required Action B.2 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. An inoperable DG exists; and

b. A required feature on the other train (Train A or Train B) is inoperable.

If at any time during the existence of this Condition (one DG inoperable) a required feature subsequently becomes inoperable, this Completion Time would begin to be tracked.

Discovering one required DG inoperable coincident with one or more inoperable required support or supported features, or both, that are associated with the OPERABLE DG, results in starting the Completion Time for the Required Action. Four hours from the discovery of these events existing concurrently is acceptable because it minimizes risk while allowing time for restoration before subjecting the unit to transients associated with shutdown.

BASES

ACTIONS

B.2 (continued)

In this Condition, the remaining OPERABLE DG and paths are adequate to supply electrical power to the onsite Safeguards Distribution System. Thus, on a component basis, single failure protection for the required feature's function may have been lost; however, function has not been lost. The 4 hour Completion Time takes into account the OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 4 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

B.3.1 and B.3.2

Required Action B.3.1 provides an allowance to avoid unnecessary testing of the OPERABLE DG. If it can be determined that the cause of the inoperable DG does not exist on the OPERABLE DG, SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on the other DG, the other DG would be declared inoperable upon discovery and Condition E of LCO 3.8.1 would be entered. Once the failure is repaired, the common cause failure no longer exists, and Required Action B.3.1 is satisfied. If the cause of the initial inoperable DG cannot be confirmed not to exist on the remaining DG, performance of SR 3.8.1.2 suffices to provide assurance of continued OPERABILITY of that DG.

In the event the inoperable DG is restored to OPERABLE status prior to completing either B.3.1 or B.3.2, the plant corrective action program will continue to evaluate the common cause possibility. This continued evaluation, however, is no longer under the 24 hour constraint imposed while in Condition B.

BASES

ACTIONS

B.3.1 and B.3.2 (continued)

According to the Maintenance Rule, 24 hours is reasonable to confirm that the OPERABLE DG is not affected by the same problem as the inoperable DG.

B.4

Operation may continue in Condition B for a period that should not exceed 7 days.

In Condition B, the remaining OPERABLE DG and paths are adequate to supply electrical power to the onsite Safeguards Distribution System. The 7 day Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action B.4 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, an offsite circuit is inoperable and that circuit is subsequently restored OPERABLE, the LCO may already have been not met for up to 7 days. This could lead to a total of 14 days, since initial failure to meet the LCO, to restore the DG. At this time, an offsite circuit could again become inoperable, the DG restored OPERABLE, and an additional 7 days (for a total of 21 days) allowed prior to complete restoration of the LCO. The 14 day Completion Time provides a limit on time allowed in a specified condition after discovery of failure to meet the LCO. This limit

BASES

ACTIONS

B.4 (continued)

is considered reasonable for situations in which Conditions A and B are entered concurrently. The "AND" connector between the 7 day and 14 day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

As in Required Action B.2, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed time "clock." This will result in establishing the "time zero" at the time that the LCO was initially not met, instead of at the time Condition B was entered.

C.1 and C.2

Required Action C.1, which applies when two paths are inoperable, is intended to provide assurance that an event with a coincident single failure will not result in a complete loss of redundant required safety functions. The Completion Time for this failure of redundant required features is 12 hours. The rationale for the 12 hours is that a Completion Time of 24 hours is allowed for two paths inoperable, based upon the assumption that two complete safety trains are OPERABLE. When a concurrent redundant required feature failure exists, this assumption is not the case, and a Completion Time of 12 hours is appropriate. These features are powered from redundant AC safety trains.

BASES

ACTIONS

C.1 and C.2 (continued)

The Completion Time for Required Action C.1 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action the Completion Time only begins on discovery that both:

a. Both paths are inoperable; and

b. A required feature on either train is inoperable.

If at any time during the existence of Condition C (two paths inoperable) a required feature becomes inoperable, this Completion Time begins to be tracked.

Operation may continue in Condition C for a period that should not exceed 24 hours. This level of degradation means that the offsite electrical power system does not have the capability to effect a safe shutdown and to mitigate the effects of an accident; however, the onsite AC sources have not been degraded. This level of degradation generally corresponds to a total loss of the immediately accessible offsite power sources.

With both of the required paths inoperable, sufficient onsite AC sources are available to maintain the unit in a safe shutdown condition in the event of a DBA or transient. In fact, a simultaneous loss of offsite AC sources, a LOCA, and a worst case single failure were postulated as a part of the design basis in the safety analysis. Thus, the 24 hour Completion Time provides a period of time to effect restoration of one of the paths commensurate with the importance of maintaining an AC electrical power system capable of meeting its design criteria.

BASES

ACTIONS

C.1 and C.2 (continued)

With the available offsite AC sources, two less than required by the LCO, operation may continue for 24 hours. If two paths are restored within 24 hours, unrestricted operation may continue. If only one path is restored within 24 hours, power operation continues in accordance with Condition A.

D.1 and D.2

Pursuant to LCO 3.0.6, the Distribution System ACTIONS would not be entered even if all AC sources to it were inoperable, resulting in de-energization. Therefore, the Required Actions of Condition D are modified by a Note to indicate that when Condition D is entered with no AC source to either train, the Conditions and Required Actions for LCO 3.8.9, "Distribution Systems-Operating," must be immediately entered. This allows Condition D to provide requirements for the loss of one path and one DG, without regard to whether a train is de-energized. LCO 3.8.9 provides the appropriate restrictions for a de-energized train.

Operation may continue in Condition D for a period that should not exceed 12 hours.

In Condition D, redundancy is lost in both the offsite electrical power system and the onsite AC electrical power system. Since power system redundancy is provided by two diverse sources of power, however, the reliability of the power systems in this Condition may appear higher than that in Condition C (loss of both required paths). This difference in reliability is offset by the susceptibility of this power system configuration to a single bus or switching failure. The 12 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

BASES

ACTIONS (continued)

E.1

With Train A and Train B DGs inoperable, there are no remaining standby AC sources. Thus, with an assumed loss of offsite electrical power, insufficient standby AC sources are available to power the minimum required ESF functions. Since the offsite electrical power system is the only source of AC power for this level of degradation, the risk associated with continued operation for a very short time could be less than that associated with an immediate controlled shutdown (the immediate shutdown could cause grid instability, which could result in a total loss of AC power). Since inadvertent generator trips could result in a total loss of offsite AC power, however, the time allowed for continued operation is severely restricted. The intent here is to avoid the risk associated with an immediate controlled shutdown and to minimize the risk associated with this level of degradation.

With both DGs inoperable, operation may continue for a period that should not exceed 2 hours.

F.1 and F.2

If the inoperable AC electric power sources cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

ACTIONS (continued)

G.1

Condition G corresponds to a level of degradation in which all redundancy in the AC electrical power supplies has been lost. At this severely degraded level, any further losses in the AC electrical power system may cause a loss of function. Therefore, no additional time is justified for continued operation. The unit is required by LCO 3.0.3 to commence a controlled shutdown.

SURVEILLANCE REQUIREMENTS

The AC sources are designed to permit inspection and testing of all important areas and features, especially those that have a standby function, as discussed in the USAR (Ref. 2). Periodic component tests are supplemented by extensive functional tests during refueling outages (under simulated accident conditions). The SRs for demonstrating the OPERABILITY of the DGs are in accordance with regulatory guidance as addressed in the USAR. The voltages and frequencies discussed in these SRs are consistent with analysis described in the USAR (Ref. 2).

SR 3.8.1.1

This SR ensures proper circuit continuity for the offsite AC electrical power supply to the onsite distribution network and availability of offsite AC electrical power. The breaker alignment verifies that each breaker is in its correct position to ensure that distribution buses and loads are connected to their offsite power source, and that appropriate independence of offsite circuits is maintained. The 7 day Frequency is adequate since breaker position is not likely to change without the operator being aware of it and because its status is displayed in the control room.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.2 and SR 3.8.1.6

These SRs help to ensure the availability of the standby electrical power supply to mitigate DBAs and transients and to maintain the unit in a safe shutdown condition.

To minimize the wear on moving parts that do not get lubricated when the engine is not running, these SRs are modified by a Note (Note 2 for SR 3.8.1.2) to indicate that all DG starts for these Surveillances may be preceded by an engine prelube period and followed by a warmup period prior to loading.

In order to reduce stress and wear on diesel engines, some manufacturers recommend a modified start in which the starting speed of DGs is limited, warmup is limited to this lower speed, and the DGs are gradually accelerated to synchronous speed prior to loading. These start procedures are the intent of Note 3, which is only applicable when such modified start procedures are recommended by the manufacturer.

SR 3.8.1.6 requires that, at a 184 day Frequency, the DG starts from standby conditions and achieves required voltage and frequency within 10 seconds. The 10 second start requirement supports the assumptions of the design basis LOCA analysis in the USAR (Ref. 3). Standby conditions for a DG mean that the diesel engine coolant and oil temperatures are being maintained consistent with manufacturer recommendations.

The 10 second start requirement is not applicable to SR 3.8.1.2 (see Note 3) when a modified start procedure as described above is used. If a modified start is not used, the 10 second start requirement of SR 3.8.1.6 applies.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.2 and SR 3.8.1.6 (continued)

Since SR 3.8.1.6 requires a 10 second start, it is more restrictive than SR 3.8.1.2, and it may be performed in lieu of SR 3.8.1.2. This is the intent of Note 1 of SR 3.8.1.2.

The 31 day Frequency for SR 3.8.1.2 and the 184 day Frequency for SR 3.8.1.6 provide adequate assurance of DG OPERABILITY, while minimizing degradation resulting from testing.

SR 3.8.1.3

This Surveillance verifies that the DGs are capable of synchronizing with the offsite electrical system and accepting loads greater than or equal to the manufacturer's recommended loads (Ref. 2). The Unit 1 and Unit 2 diesel generators have different loading requirements since their individual loads are different. As an example, the Unit 2 diesel generators supply emergency power to the cooling water pump whereas the Unit 1 diesel generators do not. A minimum run time of 60 minutes is required to stabilize engine temperatures, while minimizing the time that the DG is connected to the offsite source.

The 31 day Frequency for this Surveillance is consistent with SR 3.8.1.2.

This SR is modified by four Notes. Note 1 indicates that diesel engine runs for this Surveillance may include gradual loading, as recommended by the manufacturer, so that mechanical stress and wear on the diesel engine are minimized. Note 2 states that momentary transients, because of changing loads or system

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.3 (continued)

characteristics, do not invalidate this test. Note 3 indicates that this Surveillance should be conducted on only one DG at a time in order to avoid common cause failures that might result from path or grid perturbations. Note 4 stipulates a prerequisite requirement for performance of this SR. A successful DG start must precede this test to credit satisfactory performance.

SR 3.8.1.4

This SR provides verification that the level of fuel oil in the day tank is at least 300 gallons (Unit 2 - 425 gallons). The limit switch ensures this level is maintained in the day tank. The level is selected to ensure adequate fuel oil for a minimum of 2 hours for Unit 1 (1 hour of DG operation at full load plus 10% for Unit 2).

The 31 day Frequency is adequate to assure that a sufficient supply of fuel oil is available, since low level alarms are provided and facility operators would be aware of any large uses of fuel oil during this period.

SR 3.8.1.5

This Surveillance demonstrates that each required fuel oil transfer pump operates and transfers fuel oil from its associated storage tank to its associated day tank. This is required to support continuous operation of standby power sources. This Surveillance provides assurance that the fuel oil transfer pump is OPERABLE, the fuel oil piping system is intact, the fuel delivery piping is not obstructed, and the controls and control systems for automatic fuel transfer systems are OPERABLE.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.5 (continued)

The design of fuel transfer systems is such that pumps operate automatically in order to maintain an adequate volume of fuel oil in the day tanks during or following DG testing. Therefore, a 31 day Frequency is appropriate.

SR 3.8.1.6

See SR 3.8.1.2.

SR 3.8.1.7

This Surveillance demonstrates the DG capability to reject a load equivalent to the largest single load without tripping. The DG load rejection may occur because of an inadvertent breaker tripping. This Surveillance ensures proper engine response under the simulated test conditions. This test simulates a load rejection and verifies that the DG does not trip upon loss of the largest single load.

The 24 month Frequency is consistent with the expected fuel cycle lengths.

SR 3.8.1.8

This Surveillance demonstrates that DG noncritical protective functions (e.g., high jacket water temperature) are bypassed on an actual or simulated safety injection (SI) signal, and critical protective functions (e.g., engine overspeed, generator differential current, and ground fault (Unit 1)) trip the DG to avert substantial damage to the

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.8 (continued)

DG unit. The noncritical trips are bypassed during DBAs and provide an alarm on an abnormal engine condition. This alarm provides the operator with sufficient time to react appropriately. The DG availability to mitigate the DBA is more critical than protecting the engine against minor problems that are not immediately detrimental to emergency operation of the DG.

The 24 month Frequency is based on engineering judgment, taking into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.8.1.9

Demonstrate once per 24 months that the DGs can start and run continuously at full load capability for an interval of not less than 24 hours, ≥ 2 hours of which is at a load equivalent to 103 - 110% of the continuous duty rating and the remainder of the time at a load equivalent to the continuous duty rating of the DG. The DG starts for this Surveillance can be performed either from standby or hot conditions. The provisions for prelubricating and warmup, discussed in SR 3.8.1.2, and for gradual loading, discussed in SR 3.8.1.3, are applicable to this SR.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.9 (continued)

The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

The 24 month Frequency takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This Surveillance is modified by a Note. The Note states that momentary transients due to changing loads do not invalidate this test.

SR 3.8.1.10

In the event of a DBA coincident with a loss of offsite power, the DGs are required to supply the necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded.

This Surveillance demonstrates the DG operation during a loss of offsite power actuation test signal in conjunction with an SI actuation signal. In lieu of actual demonstration of connection and loading of emergency loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.1.10 (continued)

The Frequency of 24 months takes into consideration unit conditions required to perform the Surveillance and is intended to be consistent with an expected fuel cycle length of 24 months.

This SR is modified by two Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. The reason for Note 2 is that the performance of the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems.

SR 3.8.1.11

This Surveillance demonstrates the as designed operation of the standby power sources during loss of the offsite source. This test verifies DG starts on the loss of offsite power. Tests of other design features associated with loss of offsite power are satisfied by SR 3.8.1.10.

The Frequency of 24 months takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by a Note. The reason for the Note is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs may be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations.

BASES (continued)

REFERENCES	1.	AEC "General Design Criteria for Nuclear Power Plant Construction Permits," Criterion 39, issued for comment July 10, 1967, as referenced in the USAR, Section 1.2.
	2.	USAR, Section 8.
	3.	USAR, Section 14.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.2 AC Sources-Shutdown

BASES

BACKGROUND

A description of the AC sources is provided in the Bases for LCO 3.8.1, "AC Sources-Operating."

APPLICABLE SAFETY ANALYSES

The OPERABILITY of the minimum AC sources during MODES 5 and 6 and during movement of irradiated fuel assemblies ensures that:

a. The unit can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate AC electrical power is provided to mitigate events postulated during shutdown, such as a fuel handling accident.

In general, when the unit is shut down, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, 3, and 4 have no specific analyses in MODES 5 and 6. Worst case bounding events are deemed not credible in MODES 5 and 6 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

BASES

APPLICABLE SAFETY ANALYSES (continued)

During MODES 1, 2, 3, and 4, various deviations from the analysis assumptions and design requirements are allowed within the Required Actions. This allowance is in recognition that certain testing and maintenance activities must be conducted provided an acceptable level of risk is not exceeded. During MODES 5 and 6, performance of a significant number of required testing and maintenance activities is also required. In MODES 5 and 6, the activities are generally planned and administratively controlled. Relaxations from MODES 1, 2, 3, and 4 LCO requirements are acceptable during shutdown modes based on:

a. The fact that time in an outage is limited. This is a risk prudent goal as well as a utility economic consideration.

b. Requiring appropriate compensatory measures for certain conditions. These may include administrative controls, reliance on systems that do not necessarily meet typical design requirements applied to systems credited in operating MODE analyses, or both.

c. Prudent utility consideration of the risk associated with multiple activities that could affect multiple systems.

d. Maintaining, to the extent practical, the ability to perform required functions (even if not meeting MODES 1, 2, 3, and 4 OPERABILITY requirements) with systems assumed to function during an event.

In the event of an accident during shutdown, this LCO ensures the capability to support systems necessary to avoid immediate difficulty, assuming either a loss of all offsite power or a loss of all onsite diesel generator (DG) power.

The AC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES (continued)

LCO

One path capable of supplying the onsite 4 kV Safeguards Distribution subsystem(s) of LCO 3.8.10, "Distribution Systems - Shutdown," ensures that all required loads are powered from offsite power. An OPERABLE DG, associated with the distribution system train required to be OPERABLE by LCO 3.8.10, ensures a diverse power source is available to provide electrical power support, assuming a loss of the path. Together, OPERABILITY of the required path and DG ensures the availability of sufficient AC sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents).

The path must be capable of maintaining rated frequency and voltage, and accepting required loads during an accident, while connected to the Safeguards bus(es). Paths are those that are described in the USAR and are part of the licensing basis for the unit.

There are four separate external power sources which provide multiple offsite network connections:

a. A reserve transformer (1R) from the 161 kV portion of the plant substation;

b. A second reserve transformer (2RS/2RY) from the 345 kV portion of the plant substation;

c. A cooling tower transformer (CT1/CT11) supplied from the 345 kV portion of the plant substation; and

d. A cooling tower transformer (CT12) supplied from a tertiary winding on the substation auto transformer.

BASES

LCO (continued)

The DG must be capable of starting, accelerating to required speed and voltage, and connecting to its respective Safeguards bus on detection of bus undervoltage. The DG will be ready to load within 10 seconds of receiving a start signal. The DG must be capable of accepting required loads within the assumed loading sequence intervals, and continue to operate until offsite power can be restored to the Safeguards buses. These capabilities are required to be met from a variety of initial conditions such as DG in standby with the engine hot or DG in standby at ambient conditions.

Proper sequencing of loads is a required function for DG OPERABILITY.

It is acceptable for the operating unit to be cross tied to the shutdown unit, allowing an offsite power circuit to supply power to various equipment for the shutdown unit.

A Note has been added allowing the LCO not being applicable for a period of 8 hours during the performance of SR 3.8.1.10. This is acceptable since the DG(s) are available for operation and the primary offsite source can be made available within a short time.

APPLICABILITY

The AC sources required to be OPERABLE in MODES 5 and 6 and during movement of irradiated fuel assemblies provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core;

b. Systems needed to mitigate a fuel handling accident are available;

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

BASES

APPLICABILITY (continued)

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The AC power requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.1.

The Load Sequencer requirements are covered in LCO 3.3.4, "4 kV Safeguards Bus Voltage Instrumentation".

ACTIONS

LCO 3.0.3 is not applicable while in MODE 5 or 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Entering LCO 3.0.3 while in MODES 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

A.1, A.2, A.3, A.4, B.1, B.2, B.3, and B.4

A required path would be considered inoperable if it were not available to at least one required Safeguards train. Although two trains may be required by LCO 3.8.10, the one train with offsite power available may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS and fuel movement.

BASES

ACTIONS

A.1, A.2, A.3, A.4, B.1, B.2, B.3, and B.4 (continued)

With the required DG inoperable, the minimum required diversity of AC power sources is not available. It is, therefore, required to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and operations involving positive reactivity additions that could result in loss of required SDM (MODE 5) or boron concentration (MODE 6). Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

Suspension of these activities does not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC sources and to continue this action until restoration is accomplished in order to provide the necessary AC power to the unit safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required AC electrical power sources should be completed as quickly as possible in order to minimize the time during which the unit safety systems may be without sufficient power.

BASES

ACTIONS

A.1, A.2, A.3, A.4, B.1, B.2, B.3, and B.4 (continued)

Pursuant to LCO 3.0.6, the Distribution System's ACTIONS would not be entered even if all AC sources to it are inoperable, resulting in de-energization. Therefore, the Required Actions of Condition A are modified by a Note to indicate that when Condition A is entered with no AC power to any required Safeguards bus, the ACTIONS for LCO 3.8.10 must be immediately entered. This Note allows Condition A to provide requirements for the loss of the path, whether or not a train is de-energized. LCO 3.8.10 would provide the appropriate restrictions for the situation involving a de-energized train.

SURVEILLANCE REQUIREMENTS

SR 3.8.2.1

SR 3.8.2.1 requires the SRs from LCO 3.8.1 that are necessary for ensuring the OPERABILITY of the AC sources in other than MODES 1, 2, 3, and 4.

This SR is modified by a Note. The reason for the Note is to preclude requiring the OPERABLE DG(s) from being paralleled with the offsite power grid or otherwise rendered inoperable during performance of SRs, and to preclude de-energizing a required 4 kV Safeguards bus or disconnecting a required path during performance of SRs. With limited AC sources available, a single event could compromise both the required path and the DG. It is the intent that these SRs must still be capable of being met, but actual performance is not required during periods when the DG and required path is required to be OPERABLE. Refer to the corresponding Bases for LCO 3.8.1 for a discussion of each SR.

REFERENCES

None.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.3 Diesel Fuel Oil

BASES

BACKGROUND

Each unit is provided with a fuel oil capacity sufficient to operate the diesel generator (DGs) for a period of 14 days while the DG is supplying maximum post loss of coolant accident load demand as discussed in the USAR (Ref. 1). This onsite fuel oil capacity is sufficient to operate the DGs for longer than the time to replenish the onsite supply from outside sources.

New DG fuel oil is placed in a receiving tank where it is tested in accordance with the PI Diesel Fuel Oil Testing Program. Once the test results have verified that the fuel oil is within limits, the fuel oil may be transferred to the safeguards fuel oil storage tanks. Fuel oil is then transferred from the safeguards fuel oil storage tank to the day tank by the fuel oil transfer pumps associated with each storage tank. Redundancy of pumps and piping precludes the failure of one pump, or the rupture of any pipe, valve or tank to result in the loss of more than one DG.

For proper operation of the DGs, it is necessary to ensure the proper quality of the fuel oil. PI ensures fuel oil quality through implementation of the Diesel Fuel Oil Testing Program.

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the USAR (Ref. 2) assume Engineered Safety Feature (ESF) systems are OPERABLE. The DGs are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that fuel, Reactor Coolant System and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

BASES

APPLICABLE SAFETY ANALYSES (continued)

Since the diesel fuel oil system supports the operation of the standby AC power sources, it satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Stored diesel fuel oil is required to have sufficient supply for one DG on each unit to operate for 14 days (Ref. 1). It is also required to meet specific standards for quality. This requirement, in conjunction with an ability to obtain replacement supplies within 14 days, supports the availability of DGs required to shut down the reactor and to maintain it in a safe condition for an anticipated operational occurrence (AOO) or a postulated DBA with loss of offsite power. DG day tank fuel requirements, as well as transfer capability from the safeguards storage tank to the day tank, are addressed in LCO 3.8.1, "AC Sources-Operating," and LCO 3.8.2, "AC Sources-Shutdown."

APPLICABILITY

The AC sources (LCO 3.8.1 and LCO 3.8.2) are required to ensure the availability of the required power to shut down the reactor and maintain it in a safe shutdown condition after an AOO or a postulated DBA. Since stored diesel fuel oil supports LCO 3.8.1 and LCO 3.8.2, it is required to be within limits when the DG(s) is required to be OPERABLE.

ACTIONS

A.1

In this Condition, the 14 day fuel oil supply for the DGs is not available. However, the Condition is restricted to fuel oil supply reductions that maintain at least a 12 day supply. These circumstances may be caused by events, such as full load operation required after an inadvertent start while at minimum required supply, or feed and bleed operations, which may be necessitated by increasing particulate levels or any number of other oil quality degradations. This restriction allows sufficient time for obtaining the requisite replacement volume and performing the analyses

BASES

ACTIONS

A.1 (continued)

required prior to addition of fuel oil to the tank(s). A period of 48 hours is considered sufficient to complete restoration of the required supply prior to declaring the DGs inoperable. This period is acceptable based on the remaining capacity (> 12 days), the fact that procedures will be initiated to obtain replenishment, and the low probability of an event during this brief period.

B.1

This Condition is entered as a result of a failure to meet the acceptance criterion of SR 3.8.3.2. If fuel oil properties in one or more required DG fuel oil tank(s) are not within limits, actions must be taken to restore the fuel oil properties to within limits. If the fuel oil properties in the fuel oil tank(s) are not within limits, it does not mean failure of the fuel oil to burn properly in the diesel engine, and particulate concentration is unlikely to change significantly between Surveillance Frequency intervals, and proper engine performance has been recently demonstrated it is prudent to allow a brief period prior to declaring the associated DG inoperable or isolating the associated fuel oil tank(s). Therefore the 7 day Completion Time allows for further evaluation, resampling and re-analysis of the DG fuel oil.

C.1

With a Required Action and associated Completion Time of Condition B not met, the associated fuel oil tank must be isolated within 2 hours. Isolation of a specific fuel oil tank may not make the associated DG inoperable since the DG can take suction from another fuel oil tank. Isolation of the associated fuel oil tank may cause entry into Conditions A or D which could result in the DG being inoperable.

BASES

ACTIONS (continued)

D.1

With the stored fuel oil supply not within the limits specified or Required Actions and associated Completion Times of Conditions A or C not met, the DGs may be incapable of performing their intended function and must be immediately declared inoperable.

A Note has been added to Condition D requiring entry into the applicable Conditions and Required Actions of LCO 3.7.8, "CL System" for CL train(s) made inoperable as a result of stored fuel oil properties not within limits. Since the diesel generators and the diesel driven CL pumps share a common storage tank, the diesel fuel oil properties are maintained by Specification 5.5.11, "Diesel Fuel Oil Testing Program." Therefore, if the fuel oil properties are not within limits, both the diesel generators and the diesel driven CL pumps are affected and appropriate Required Actions taken.

SURVEILLANCE REQUIREMENTS

SR 3.8.3.1

This SR provides verification that there is an adequate inventory of fuel oil in the storage tanks to support the operation of one DG for 14 days. The 14 day period is sufficient time to place the unit in a safe shutdown condition and to bring in replenishment fuel from an offsite location.

The specified fuel oil inventory for the Unit 1 diesel generators (DGs) is in addition to the fuel oil inventory specified for the diesel driven cooling water pumps (LCO 3.7.8) that must be available in the Unit 1 diesel fuel oil storage system. There are four Design Class I fuel oil storage tanks for the Unit 1 DGs and two Design Class I fuel oil storage tanks for the diesel driven cooling water pumps. These six Design Class I tanks are interconnected such that any tank can be manually aligned to supply any Unit 1 DG or diesel driven cooling water pump day tank. Any combination of inventory in these six tanks may be used to satisfy the inventory requirements for the Unit 1 DGs and the diesel driven cooling water pumps.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.3.1 (continued)

There are four Unit 2 Design Class I fuel oil storage tanks. The four Unit 2 tanks are interconnected such that any tank can be manually aligned to supply either Unit 2 DG day tank. Any combination of inventory in these four Unit 2 tanks may be used to satisfy the Unit 2 DG inventory requirements.

The 31 day Frequency is adequate to ensure that a sufficient supply of fuel oil is available, since low level alarms are provided and unit operators would be aware of any large uses of fuel oil during this period.

SR 3.8.3.2

The tests for the new fuel oil prior to addition into the safeguards storage tank(s) are a means of determining whether new fuel oil is of the appropriate grade and has not been contaminated with substances that would have an immediate, detrimental impact on diesel engine combustion. If results from these tests are within acceptable limits, the fuel oil may be added to the safeguards storage tanks without concern for contaminating the entire volume of fuel oil in the safeguards storage tanks. These tests are to be conducted prior to adding the new fuel to the safeguards storage tank(s), but in no case is the time between receipt of new fuel and conducting the tests to exceed 31 days. The tests and limits for new and stored fuel are described in the Diesel Fuel Oil Testing Program of Specification 5.5.11.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.3.2 (continued)

Failure to meet any of the limits specified in the Diesel Fuel Oil Testing Program is cause for rejection the new fuel oil, but does not represent a failure to meet the LCO concern since the fuel oil is not added to the storage tanks. Failure to meet any of the limits for stored fuel requires entry into Condition B.

REFERENCES

1. USAR, Sections 8.4 and 10.3.
2. USAR, Section 14.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources - Operating

BASES

BACKGROUND

The DC safeguards electrical power system provides the AC emergency power system with control power. It also provides both motive and control power to selected safety related equipment and Reactor Protection Instrument AC Panel power (via inverters). As required by AEC GDC 39 (Ref. 1), the DC safeguards electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure.

The 125 VDC safeguards electrical power system consists of two independent and redundant safety related DC safeguards electrical power subsystems (Train A and Train B). Each subsystem consists of a 125 VDC battery, a battery charger, and all the associated control equipment and interconnecting cabling.

There is one portable battery charger, which can provide backup service in the event that a stationary battery charger is out of service. If the portable battery charger is substituted for the stationary battery charger, then the requirements of independence and redundancy between subsystems are maintained.

During normal operation, the 125 VDC load is powered from the battery chargers with the batteries floating on the system. In case of loss of normal power to the battery charger, the DC load is automatically powered from the station batteries.

BASES

BACKGROUND (continued)

The Train A and Train B DC safeguards electrical power subsystems provide the control power for their associated safeguards AC power load group, 4.16 kV switchgear, and 480 V switchgear. The DC safeguards electrical power subsystems also provide backup DC electrical power to the inverters, which in turn power the Reactor Protection Instrument AC Panels.

The DC safeguards power distribution system is described in more detail in Bases for LCO 3.8.9, "Distribution System - Operating," and LCO 3.8.10, "Distribution Systems - Shutdown."

Each 125 VDC battery is separately housed in a ventilated room with its charger and main DC distribution panels. Each subsystem is located in an area separated physically and electrically from the other subsystem to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing between redundant safeguards DC subsystems, such as batteries, battery chargers, or distribution panels.

Each battery has adequate storage capacity to meet the duty cycle(s) discussed in the USAR (Ref. 2). The battery is designed with additional capacity above that required by the design duty cycle to allow for temperature variations and other factors.

The batteries for Train A and Train B DC electrical power subsystems are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life cycles and the 100% design demand. The minimum design voltage limit is 105 V.

BASES

BACKGROUND (continued)

The battery cells are of flooded lead acid construction with a nominal specific gravity of 1.215. This specific gravity corresponds to an open circuit battery voltage of approximately 120 V for a 58 cell battery (i.e., cell voltage of 2.065 volts per cell (Vpc)). The open circuit voltage is the voltage maintained when there is no charging or discharging. Once fully charged with its open circuit voltage ≥ 2.065 Vpc, the battery cell will maintain its capacity greater than 30 days without further charging per manufacturer's instructions. Optimal long term performance however, is obtained by maintaining a float voltage 2.20 to 2.25 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge. A nominal float voltage of 2.23 Vpc corresponds to a total float voltage output of 129.4 V for a 58 cell battery.

Each Train A and Train B DC electrical power subsystem battery charger has ample power output capacity for the steady state operation of connected loads required during normal operation, while at the same time maintaining its battery fully charged. Each battery charger also has sufficient excess capacity to restore the battery to its fully charged state within 24 hours while supplying normal steady state loads discussed in the USAR (Ref. 2).

The battery charger is normally in the float-charge mode. Float-charge is the condition in which the charger is supplying the connected loads and the battery cells are receiving adequate current to optimally charge the battery. This assures the internal losses of a battery are overcome and the battery is maintained in a fully charged state.

When desired, the charger can be placed in the equalize mode. The equalize mode is at a higher voltage than the float mode and charging current is correspondingly higher. The battery charger is operated in the equalize mode after a battery discharge or for routine maintenance. Following a battery discharge, the battery recharge

BASES

BACKGROUND (continued)	characteristic accepts current at the current limit of the battery charger (if the discharge was significant, e.g., following a battery service test) until the battery terminal voltage approaches the charger voltage setpoint. Charging current then reduces exponentially during the remainder of the recharge cycle. Lead-calcium batteries have recharge efficiencies of greater than 95%, so once at least 105% of the ampere-hours discharged have been returned, the battery capacity would be restored to the same condition as it was prior to the discharge. This can be monitored by direct observation of the exponentially decaying charging current or by evaluating the amp-hours discharged from the battery and amp-hours returned to the battery.
APPLICABLE SAFETY ANALYSES	The initial conditions of Design Basis Accident (DBA) and transient analyses in the USAR, (Ref. 3), assume that Engineered Safety Feature (ESF) systems are OPERABLE. The DC electrical power system provides normal and emergency DC safeguards electrical power for the DGs, emergency auxiliaries, and control and switching during all MODES of operation. The OPERABILITY of the DC sources is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining the DC sources OPERABLE during accident conditions in the event of: a. An assumed loss of all offsite AC power; and b. A worst-case single failure. The DC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii)

BASES (continued)

LCO

The DC safeguards electrical power subsystem, each subsystem consisting of a battery, battery charger and the corresponding control equipment and interconnecting cabling, supplying power to the associated panel within the train are required to be OPERABLE to ensure the availability of the required power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. Loss of any train DC safeguards electrical power subsystem does not prevent the minimum safety function from being performed (Ref. 2).

An OPERABLE DC safeguards electrical power subsystem requires the battery and a respective charger to be operating and connected to the associated DC panel.

APPLICABILITY

The DC safeguards electrical power sources are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure safe unit operation and to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs; and

b. Adequate core cooling is provided, and containment integrity and other vital functions are maintained in the event of a postulated DBA.

The DC electrical power requirements for MODES 5 and 6 are addressed in the Bases for LCO 3.8.5, "DC Sources - Shutdown."

BASES (continued)

ACTIONS

A.1, A.2, A.3, and A.4

Condition A represents one battery charger inoperable (e.g., the voltage limit of SR 3.8.4.1 is not maintained). Required Actions A.1 and A.2 verify that the associated battery and other train charger are OPERABLE within 2 hours. This time provides for returning the inoperable charger to OPERABLE status or verifying that the associated battery and other train charger are OPERABLE and no loss of function exists.

Required Action A.3 requires, within 2 hours, that the diesel generator and safeguards equipment on the other train are verified to be OPERABLE. This verification ensures that the redundant train is OPERABLE ensuring that the plant will be able to mitigate an event as analyzed in the USAR (Ref. 3).

Required Action A.4 limits the restoration time for the inoperable battery charger to 8 hours. The 8 hour Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to OPERABLE status.

B.1, B.2, B.3, and B.4

Condition B represents one battery inoperable. With one battery inoperable, the DC bus is being supplied by the OPERABLE battery charger. Any event that results in a loss of the AC bus supporting the battery charger will also result in loss of DC to that train. Recovery of the AC bus, especially if it is due to a loss of offsite power, will be hampered by the fact that many of the components necessary for the recovery (e.g., diesel generator control and field flash, AC load shed and diesel generator output circuit breakers, etc.) likely rely upon the battery. Required Actions B.1, B.2, and B.3

BASES

ACTIONS

B.1, B.2, B.3, and B.4 (continued)

verify that the associated battery charger, the other train battery and associated charger are OPERABLE within 2 hours. This time provides for either returning the inoperable battery to OPERABLE status or verifying that the associated charger and other train battery and charger are OPERABLE therefore, ensuring no loss of function exists.

Required Action B.4 requires the inoperable battery to be restored to OPERABLE within 8 hours. The 8 hour limit allows sufficient time to effect restoration of an inoperable battery given that the majority of the conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than 2.07 V, etc.) are identified in Specifications 3.8.4, 3.8.5, and 3.8.6 together with additional specific completion times.

C.1

Condition C represents one train with a loss of ability to completely respond to an event, and a potential loss of ability to remain energized during normal operation. It is therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for complete loss of DC power to the affected train. The 2 hour limit is consistent with the allowed time for an inoperable DC distribution system train.

If one of the required DC electrical power subsystems is inoperable for reasons other than Condition A or B (e.g., inoperable battery charger and associated inoperable battery), the remaining DC electrical power subsystem has the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst case single failure could, however, result in the loss of minimum necessary DC electrical subsystems to mitigate a worst

BASES

ACTIONS

C.1 (continued)

case accident, continued power operation should not exceed 2 hours. The 2 hour Completion Time reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem and, if the DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown.

D.1 and D.2

If the inoperable DC safeguards electrical power subsystem cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems. The Completion Time to bring the unit to MODE 5 is consistent with other standard shutdown conditions.

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage while on float charge for the batteries helps to ensure the effectiveness of the battery chargers, which support the ability of the batteries to perform their intended function. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the battery in a fully charged state while supplying the continuous steady state loads of the associated DC subsystem. On float charge, battery cells will receive adequate

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1 (continued)

current to optimally charge the battery. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the minimum float voltage established by the battery manufacturer (2.20 Vpc or 128 V at the battery terminals). This voltage maintains the battery plates in a condition that supports maintaining the grid life (expected to be approximately 20 years). The 7 day Frequency is consistent with manufacturer recommendations.

SR 3.8.4.2

This SR verifies the design capacity of the battery chargers. The battery charger supply is recommended to be based on the largest combined demands of the various steady state loads and the charging capacity to restore the battery to the fully charged state, irrespective of the status of the unit during these demand occurrences. The minimum required amperes and duration ensure that these requirements can be satisfied.

This SR provides two options. One option requires that each battery charger be capable of supplying 250 amps at the minimum established float voltage for 4 hours. The ampere requirements are based on the USAR (Ref. 2). The voltage requirements are based on the charger voltage level after a response to a loss of AC power. The time period is sufficient for the charger temperature to have stabilized and to have been maintained for at least 2 hours.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.2 (continued)

The other option requires that each battery charger be capable of recharging the battery after a discharge test coincident with supplying the demands of the various continuous steady state loads, after the battery discharge to the bounding design basis event discharge state. The duration for this test may be longer than the charger sizing criteria since the battery recharge is affected by float voltage, temperature, and the exponential decay in charging current. The battery is fully recharged when the measured charging current is ≤ 2 amps.

The Surveillance Frequency is acceptable, given the unit conditions required to perform the test and the other administrative controls existing to ensure adequate charger performance during these 24 month intervals. In addition, this Frequency is intended to be consistent with expected fuel cycle lengths.

SR 3.8.4.3

A battery service test is a special test of the battery capability, as found, to satisfy the design requirements (battery duty cycle) of the DC electrical power system. The discharge rate and test length should correspond to the design duty cycle requirements as specified in Reference 2.

The battery service test should be performed during refueling operations, or at some other outage, with intervals between tests not to exceed 24 months.

This SR is modified by two Notes. Note 1 allows the performance of a modified performance discharge test in lieu of a service test.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.3 (continued)

The reason for Note 2 is that performing the Surveillance would perturb the electrical distribution system and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1 or 2. Risk insights or deterministic methods may be used for the assessment.

REFERENCES

1. AEC "General Design Criteria for Nuclear Power Plant Construction Permits." Criterion 39, issued for comment July 10, 1976, as referenced in USAR, Section 1.2.

2. USAR, Section 8.

3. USAR, Section 6.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources - Shutdown

BASES

BACKGROUND	A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources - Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the USAR (Ref. 1) and (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators, emergency auxiliaries, and control and switching during all MODES of operation.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 5 and 6 and during movement of irradiated fuel assemblies ensures that:

a. The unit can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as a fuel handling accident.

BASES

APPLICABLE SAFETY ANALYSES (continued)

In general, when the unit is shut down, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many DBAs that are analyzed in MODES 1, 2, 3, and 4 have no specific analyses in MODES 5 and 6 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

During MODES 1, 2, 3, and 4, various deviations from the analysis assumptions and design requirements are allowed within the Required Actions. This allowance is in recognition that certain testing and maintenance activities must be conducted provided an acceptable level of risk is not exceeded. During MODES 5 and 6, performance of a significant number of required testing and maintenance activities is also required. In MODES 5 and 6, the activities are generally planned and administratively controlled. Relaxations from MODES 1, 2, 3, and 4 LCO requirements are acceptable during shutdown MODES based on:

a. The fact that time in an outage is limited. This is a risk prudent goal as well as a utility economic consideration.

b. Requiring appropriate compensatory measures for certain conditions. These may include administrative controls, reliance on systems that do not necessarily meet typical design requirements applied to systems credited in operating MODE analyses, or both.

BASES

APPLICABLE SAFETY ANALYSES (continued)

c. Prudent utility consideration of the risk associated with multiple activities that could affect multiple systems.

d. Maintaining, to the extent practical, the ability to perform required functions (even if not meeting MODES 1, 2, 3, and 4 OPERABILITY requirements) with systems assumed to function during an event.

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case Design Basis Accidents which are analyzed for operating MODES are generally viewed not to be a significant concern during shutdown MODES due to the lower energies involved. The Technical Specifications therefore require a lesser complement of electrical equipment to be available during shutdown than is required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, have found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management," as an Industry initiative to manage shutdown tasks and associated electrical support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The DC sources satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES (continued)

LCO

The DC electrical power subsystem, consisting of a battery one battery charger, and the corresponding control equipment, and interconnecting cabling within the train, is required to be OPERABLE to support one train of the distribution systems required OPERABLE by LCO 3.8.10, "Distribution Systems - Shutdown." This ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents).

A Note has been added to the LCO allowing the service building DC electrical power subsystem components to be used in lieu of the required safeguards DC electrical power subsystem components when the required safeguards DC electrical power subsystem is inoperable due to testing, maintenance, or replacement. The service building DC power electrical components include the battery, associated battery charger, and the interconnecting cabling. When any of the service building DC power electrical components are used in lieu of the safeguards DC electrical power subsystem components, they are required to be maintained in accordance with Specification 5.5.15 for monitoring various battery parameters that is based on the recommendations of IEEE Standard 450-1995, "IEEE Recommended Practice For Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries For Stationary Applications" (Ref. 3).

BASES (continued)

APPLICABILITY

The DC electrical power source required to be OPERABLE in MODES 5 and 6, and during movement of irradiated fuel assemblies, provide assurance that:

a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core;

b. Required features needed to mitigate a fuel handling accident are available;

c. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The DC electrical power requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.4.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 5 or 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Entering LCO 3.0.3, while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

BASES

ACTIONS (continued)

A.1

Condition A represents one train with one required battery charger inoperable (e.g., the voltage limit of SR 3.8.4.1 is not maintained).

Required Action A.1 limits the restoration time for the inoperable battery charger to 8 hours. The 8 hour Completion Time reflects a reasonable time to effect restoration of the qualified battery charger to OPERABLE status.

B.1, B.2, B.3, and B.4

Condition B represents one train with one required DC electrical power subsystem inoperable for reasons other than Condition A or if the Required Actions and associated Completion Time of Condition A are not met. In this Condition there may not be adequate DC power available to support the subsystems required by LCO 3.8.10. Therefore, conservative actions are required (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and operations involving positive reactivity additions) that assure the minimum SDM or boron concentration limit is met to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

BASES

ACTIONS

B.1, B.2, B.3, and B.4 (continued)

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power subsystem and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the unit safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required DC electrical power subsystems should be completed as quickly as possible in order to minimize the time during which the unit safety systems may be without sufficient power.

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1

SR 3.8.5.1 requires performance of all Surveillances required by SR 3.8.4.1 through SR 3.8.4.3. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.

This SR is modified by a Note. The reason for the Note is to preclude requiring the OPERABLE DC sources from being discharged below their capability to provide the required power supply or otherwise rendered inoperable during the performance of SRs. It is the intent that these SRs must still be capable of being met, but actual performance is not required.

REFERENCES

1. USAR Section 6.
2. SAR Section 14.
3. IEEE-450-1995.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery Parameters

BASES

BACKGROUND

This LCO delineates the limits on battery float current as well as electrolyte temperature, level, and float voltage for the DC power subsystem batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for LCO 3.8.4, "DC Sources - Operating," and LCO 3.8.5, "DC Sources-Shutdown." In addition to the limitations of this Specification, the plant procedures also implement a program specified in Specification 5.5.15 for monitoring various battery parameters that is based on the recommendations of IEEE Standard 450-1995, "IEEE Recommended Practice For Maintenance, Testing, And Replacement Of Vented Lead-Acid Batteries For Stationary Applications" (Ref. 1).

The battery cells are of flooded lead acid construction with a nominal specific gravity of 1.215. This specific gravity corresponds to an open circuit battery voltage of approximately 120 V for 58 cell battery (i.e., cell voltage of 2.065 volts per cell (Vpc)). The open circuit voltage is the voltage maintained when there is no charging or discharging. Once fully charged with its open circuit voltage $\geq$ 2.065 Vpc, the battery cell will maintain its capacity for greater than 30 days without further charging per manufacturer's instructions. Optimal long term performance however, is obtained by maintaining a float voltage 2.20 to 2.25 Vpc. This provides adequate over-potential which limits the formation of lead sulfate and self discharge. The nominal float voltage of 2.23 Vpc corresponds to a total float voltage output of 129.4 V for a 58 cell battery.

BASES (continued)

APPLICABLE SAFETY ANALYSES	The initial conditions of Design Basis Accident (DBA) and transient analyses in the USAR (Ref. 2) and (Ref. 3), assume Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the DGs, emergency auxiliaries, and control and switching during all MODES of operation. The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining at least one train of DC sources OPERABLE during accident conditions, in the event of: a. An assumed loss of all offsite AC power; and b. A worst-case single failure. Battery parameters satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).
LCO	Battery parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. Battery parameter limits are conservatively established, allowing continued DC electrical system function even with limits not met. Additional preventative maintenance, testing, and monitoring performed in accordance with the plant procedures is conducted as specified in Specification 5.5.15.
APPLICABILITY	The battery parameters are required solely for the support of the associated DC electrical power subsystems. Therefore, battery parameter limits are only required when the battery is required to be OPERABLE. Refer to the Applicability discussion in Bases for LCO 3.8.4 and LCO 3.8.5.

BASES (continued)

ACTIONS

A Note has been added to provide clarification that, for this LCO, separate Condition entry is allowed for each battery. This is acceptable, since Required Actions for each Condition provide appropriate compensatory actions.

A.1, A.2, and A.3

With one or more cells in one battery < 2.07 V, the battery cell is degraded. Within 8 hours verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage (SR 3.8.4.1) and of the overall battery state of charge by monitoring the battery float charge current (SR 3.8.6.1). This assures that there is still sufficient battery capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of one or more cells in one battery < 2.07 V, and continued operation is permitted for a limited period up to 24 hours.

Since the Required Actions only specify "perform," a failure of SR 3.8.4.1 or SR 3.8.6.1 acceptance criteria does not result in this Required Action not met. However, if one of the SRs is failed the appropriate Condition(s), depending on the cause of the failures, is entered. If SR 3.8.6.1 is failed then there may not be assurance that there is still sufficient battery capacity to perform the intended function and the battery must be declared inoperable immediately.

BASES

ACTIONS (continued)

B.1 and B.2

One battery with float > 2 amps indicates that a partial discharge of the battery capacity has occurred. This may be due to a temporary loss of a battery charger or possibly due to one or more battery cells in a low voltage condition reflecting some loss of capacity. Within 8 hours verification of the required battery charger OPERABILITY is made by monitoring the battery terminal voltage. If the terminal voltage is found to be less than the minimum established float voltage there are two possibilities, the battery charger is inoperable or is operating in the current limit mode. Condition A addresses charger inoperability. If the charger is operating in the current limit mode after 8 hours that is an indication that the battery has been substantially discharged. The time to return the battery to its fully charged condition in this case is a function of the battery charger capacity, the amount of loads on the associated DC system, the amount of the previous discharge, and the recharge characteristic of the battery. The charge time can be extensive, and there is not adequate assurance that it can be recharged within 24 hours (Required Action B.2). The battery must therefore be declared inoperable.

If the float voltage is found to be satisfactory but there are one or more battery cells with float voltage less than 2.07 V, the associated "OR" statement in Condition F is applicable and the battery must be declared inoperable immediately. If float voltage is satisfactory and there are no cells less than 2.07 V there is good assurance that, within 24 hours, the battery will be restored to its fully charged condition (Required Action B.2) from any discharge that might have occurred due to a temporary loss of the battery charger.

BASES

ACTIONS

B.1 and B.2 (continued)

A discharged battery with float voltage (the charger setpoint) across its terminals indicates that the battery is on the exponential charging current portion (the second part) of its recharge cycle. The time to return a battery to its fully charged state under this condition is simply a function of the amount of the previous discharge and the recharge characteristic of the battery. Thus there is good assurance of fully recharging the battery within 24 hours, avoiding a premature shutdown with its own attendant risk and the battery is not inoperable.

If the condition is due to one or more cells in a low voltage condition but still greater than 2.07 V and float voltage is found to be satisfactory, this is not indication of a substantially discharged battery and 24 hours is a reasonable time prior to declaring the battery inoperable.

Since Required Action B.1 only specifies "perform," a failure of SR 3.8.4.1 acceptance criteria does not result in the Required Action not met. However, if SR 3.8.4.1 is failed, the appropriate Condition(s), depending on the cause of the failure, is entered.

C.1, C.2, and C.3

With one battery with one or more cells electrolyte level above the top of the plates, but below the minimum established design limits, the battery still retains sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of electrolyte level not met. Within 31 days the minimum established design limits for electrolyte level must be re-established.

BASES

ACTIONS

C.1, C.2, and C.3 (continued)

With electrolyte level below the top of the plates there is a potential for dryout and plate degradation. Required Actions C.1 and C.2 address this potential (as well as provisions in Specification 5.5.15, Battery Monitoring and Maintenance Program). They are modified by a Note that indicates they are only applicable if electrolyte level is below the top of the plates. Within 8 hours level is required to be restored to above the top of the plates. The Required Action C.2 requirement to verify that there is no leakage by visual inspection and the Specification 5.5.15.b item to initiate action to equalize and test in accordance with manufacturer's recommendation are taken from Annex D of IEEE Standard 450-1995. They are performed following the restoration of the electrolyte level to above the top of the plates. Based on the results of the manufacturer's recommended testing the battery may have to be declared inoperable and the affected cells replaced.

D.1

With one battery with pilot cell temperature less than the minimum established design limits, 12 hours is allowed to restore the temperature to within limits. A low electrolyte temperature limits the current and power available. Since the battery is sized with margin, while battery capacity is degraded, sufficient capacity exists to perform the intended function and the affected battery is not required to be considered inoperable solely as a result of the pilot cell temperature not met.

BASES

ACTIONS (continued)

E.1

With batteries in the redundant trains with battery parameters not within limits there is not sufficient assurance that battery capacity has not been affected to the degree that the batteries can still perform their required function, given that redundant batteries are involved. With redundant batteries involved this potential could result in a total loss of function on multiple systems that rely upon the batteries. The longer Completion Times specified for battery parameters on non-redundant batteries not within limits are therefore not appropriate, and the parameters must be restored to within limits on at least one train within 8 hours.

F.1

With one or more batteries with any battery parameter outside the allowances of the Required Actions for Condition A, B, C, D, or E, sufficient capacity to supply the design load requirement is not assured and the corresponding battery must be declared inoperable. Additionally, discovering one or more batteries in one train with one or more battery cells float voltage less than 2.07 V and float current greater than 2 amps indicates that the battery capacity may not be sufficient to perform the intended functions. The battery must therefore be declared inoperable immediately.

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

Verifying battery float current while on float charge is used to determine the state of charge of the battery. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery and maintain the

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1 (continued)

battery in a charged state. The float current requirements are based on the float current indicative of a charged battery. Use of float current to determine the state of charge of the battery is consistent with IEEE-450 (Ref. 1). The 7 day Frequency is consistent with IEEE-450 (Ref. 1).

This SR is modified by a Note that states the float current requirement is not required to be met when battery terminal voltage is less than the minimum established float voltage of SR 3.8.4.1. When this float voltage is not maintained the Required Actions of LCO 3.8.4 ACTION A are being taken, which provide the necessary and appropriate verifications of the battery condition. Furthermore, the float current limit of 2 amps is established based on the nominal float voltage value and is not directly applicable when this voltage is not maintained.

SR 3.8.6.2 and SR 3.8.6.5

Optimal long term battery performance is obtained by maintaining a float voltage greater than or equal to the minimum established design limits provided by the battery manufacturer, which corresponds to 128 V at the battery terminals, or 2.20 Vpc. This provides adequate over-potential, which limits the formation of lead sulfate and self discharge, which could eventually render the battery inoperable. Float voltages in this range or less, but greater than 2.07 Vpc, are addressed in Specification 5.5.15. SRs 3.8.6.2 and 3.8.6.5 require verification that the cell float voltages are equal to or greater than the short term absolute minimum voltage of 2.07 V. The Frequency for cell voltage verification every 31 days for pilot cell and 92 days for each connected cell is consistent with IEEE-450 (Ref. 1).

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.6.3

The limit specified for electrolyte level ensures that the plates suffer no physical damage and maintains adequate electron transfer capability. The Frequency is consistent with IEEE-450 (Ref. 1).

SR 3.8.6.4

This Surveillance verifies that the pilot cell temperature is greater than or equal to the minimum established design limit (i.e., 60°F). Pilot cell electrolyte temperature is maintained above this temperature to assure the battery can provide the required current and voltage to meet the design requirements. Temperatures lower than assumed in battery sizing calculations act to inhibit or reduce battery capacity. The Frequency is consistent with IEEE-450 (Ref. 1).

SR 3.8.6.6

A battery performance discharge test is a test of constant current capacity of a battery, normally done in the as found condition, after having been in service, to detect any change in the capacity determined by the acceptance test. The test is intended to determine overall battery degradation due to age and usage.

Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.6.6.

A modified discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance discharge test should be identical to those specified for a service test.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.6.6 (continued)

It may consist of just two rates; for instance the one minute rate for the battery or the largest current load of the duty cycle, followed by the test rate employed for the performance test, both of which envelope the duty cycle of the service test. Since the ampere-hours removed by a one minute discharge represents a very small portion of the battery capacity, the test rate can be changed to that for the performance test without compromising the results of the performance discharge test. The battery terminal voltage for the modified performance discharge test must remain above the minimum battery terminal voltage specified in the battery service test for the duration of time equal to that of the service test.

The acceptance criteria for this Surveillance are consistent with IEEE-450 (Ref. 1) and IEEE-485 (Ref. 4). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements. Furthermore, the battery is sized to meet or exceed the assumed duty cycle loads when the battery design capacity reaches this 80% limit.

The Surveillance Frequency for this test is normally 60 months. If the battery shows degradation, or if the battery has reached 85% of its expected life and capacity is < 100% of the manufacturer's rating, the Surveillance Frequency is reduced to 12 months. However, if the battery shows no degradation but has reached 85% of its expected life, the Surveillance Frequency is only reduced to 24 months for batteries that retain capacity ≥ 100% of the manufacturer's ratings. Degradation is indicated, according to IEEE-450 (Ref. 1), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is ≥ 10% below the manufacturer's rating. These Frequencies are consistent with the recommendations in IEEE-450 (Ref. 1).

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.6.6 (continued)

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would perturb the electrical distribution system and challenge safety systems. This restriction from normally performing the Surveillance in MODE 1 or 2 is further amplified to allow portions of the Surveillance to be performed for the purpose of reestablishing OPERABILITY (e.g., post work testing following corrective maintenance, corrective modification, deficient or incomplete surveillance testing, and other unanticipated OPERABILITY concerns) provided an assessment determines plant safety is maintained or enhanced. This assessment shall, as a minimum, consider the potential outcomes and transients associated with a failed partial Surveillance, a successful partial Surveillance, and a perturbation of the offsite or onsite system when they are tied together or operated independently for the partial Surveillance; as well as the operator procedures available to cope with these outcomes. These shall be measured against the avoided risk of a plant shutdown and startup to determine that plant safety is maintained or enhanced when portions of the Surveillance are performed in MODE 1 or 2. Risk insights or deterministic methods may be used for the assessment.

REFERENCES

1. IEEE-450-1995.
2. USAR, Chapter 8.
3. USAR, Chapter 14.
4. IEEE-485-1983, June 1983.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.7 Inverters-Operating

BASES

BACKGROUND

The inverters are the preferred source of power for the Reactor Protection Instrument AC Panels because of the stability and reliability they achieve. The function of the inverter is to provide AC electrical power to the Reactor Protection Instrument AC Panels. The inverters can be powered from an internal AC source/rectifier or from the station battery. The station battery provides an uninterruptible power source for the instrumentation and controls for the Reactor Protection System (RPS) and the Engineered Safety Feature Actuation System (ESFAS)(Ref. 1).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the USAR (Ref. 2) assume Engineered Safety Feature systems are OPERABLE. The inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to the RPS and ESFAS instrumentation and controls so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the inverters is consistent with the initial assumptions of the accident analyses and is based on meeting the design basis of the unit. This includes maintaining required Reactor Protection Instrument AC Panels OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite AC electrical power; and

b. A worst case single failure.

Inverters satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES (continued)

LCO

The inverters ensure the availability of AC electrical power for the systems instrumentation required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA.

Maintaining the required inverters OPERABLE ensures that the redundancy incorporated into the design of the RPS and ESFAS instrumentation and controls is maintained. The four inverters ensure an uninterruptible supply of AC electrical power to the Reactor Protection Instrument AC panels even if the 4 kV Safeguards buses are de-energized.

OPERABLE inverters require the associated Reactor Protection Instrument AC panel to be powered by the inverter with output voltage power supply to the inverter from a 125 VDC station battery. Normally, the power supply is from an internal AC source via rectifier with the station battery available as the uninterruptible power supply.

APPLICABILITY

The inverters are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs; and

b. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

Inverter requirements for MODES 5 and 6 are covered in the Bases for LCO 3.8.8, "Inverters-Shutdown."

BASES (continued)

ACTIONS

A.1 and A.2

With one Reactor Protection Instrument AC inverter inoperable, Required Action A.1 and A.2 require verification, within 2 hours, the Reactor Protection Instrument AC panel with an inoperable inverter is powered from Panel 117 (Unit 2 - 217) or verify that the Reactor Protection Instrument AC panel with an inoperable inverter is powered from its inverter bypass source.

Plant design provides acceptable alternate methods of powering a Reactor Protection Instrument AC panel with an inoperable inverter. Panel 117 (Unit 2 - Panel 217), by plant design, can provide reliable power to a Reactor Protection Instrument AC panel. Alternatively, a Reactor Protection Instrument AC panel may be powered by an inverter internal bypass. In the event an inverter becomes inoperable, the the inverter static transfer bypass switch will automatically bypass, thus providing power to the associated Reactor Protection Instrument AC panel and maintain OPERABILITY. Required Actions A.1 and A.2 require verification that only one Reactor Protection Instrument AC panel is powered from Panel 117 (Unit 2 - Panel 217) or an inverter bypass source. This verification must be completed within 2 hours.

B.1, B.2, and B.3

With two Reactor Protection Instrument AC inverters inoperable, the associated Reactor Protection Instrument AC panels are considered to be inoperable unless they are energized from Panel 117 (Unit 2 - Panel 217) or they are automatically re-energized by their inverter static transfer switch.

For this reason a Note has been included in Condition B requiring the entry into the Conditions and Required Actions of LCO 3.8.9,

BASES

ACTIONS

B.1, B.2, and B.3 (continued)

"Distribution Systems — Operating." This ensures that the Reactor Protection Instrument AC panel is re-energized within 2 hours. Plant design provides acceptable alternate methods of powering Reactor Protection Instrument AC panels with an inoperable inverter. Panel 117 (Unit 2 - Panel 217), by plant design, can provide reliable power to a Reactor Protection Instrument AC panel. Alternatively, a Reactor Protection Instrument AC panel may be powered by an inverter internal bypass. In the event an inverter becomes inoperable, the inverter static transfer bypass switch will automatically bypass, thus providing power to the associated Reactor Protection Instrument AC panel and maintain OPERABILITY. Therefore, based on plant design, Required Actions B.1 and B.2 require verification that no more than one Reactor Protection Instrument AC inverter will be powered from Panel 117 (Unit 2 - Panel 217) and one or both Reactor Protection Instrument AC panel(s) are powered from an inverter bypass source. This verification must be completed within 2 hours.

Required Action B.3 allows 8 hours to fix the inoperable inverter and return it to service. The 8 hour limit is based upon engineering judgment, taking into consideration the time required to repair an inverter and the additional risk to which the unit is exposed because of the inverter inoperability. This has to be balanced against the risk of an immediate shutdown, along with the potential challenges to safety systems such a shutdown might entail. When the Reactor Protection Instrument AC panel is powered from its alternate source, it is relying upon interruptible AC electrical power sources (offsite and onsite). The uninterruptible inverter source to the Reactor Protection Instrument AC panel is the preferred source for powering instrumentation trip setpoint devices.

BASES

ACTIONS (continued)

C.1 and C.2

If the inoperable devices or components cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.8.7.1

This Surveillance verifies that the inverters are functioning properly with all required circuit breakers closed and Reactor Protection Instrument AC panels energized from the inverter. The verification of proper voltage output ensures that the required power is readily available for the instrumentation of the RPS and ESFAS connected to the Reactor Protection Instrument AC panels. The 7 day Frequency takes into account the redundant capability of the inverters and other indications available in the control room that alert the operator to inverter malfunctions.

REFERENCES

1. USAR, Section 8.
2. USAR, Section 14.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.8 Inverters-Shutdown

BASES

BACKGROUND

A description of the inverters is provided in the Bases for LCO 3.8.7, "Inverters-Operating."

APPLICABLE SAFETY ANALYSES

The OPERABILITY of the inverter to the Reactor Protection Instrumentation AC panel during MODES 5 and 6 ensures that:

a. The unit can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate power is available to mitigate events postulated during shutdown, such as a fuel handling accident.

In general, when the unit is shutdown, the Technical Specification requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, 3, and 4 have no specific analyses in MODES 5 and 6. Worst case bounding events are deemed not credible in MODES 5 and 6 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

BASES

APPLICABLE SAFETY ANALYSES (continued)

During MODES 1, 2, 3, and 4, various deviations from the analysis assumptions and design requirements are allowed within the Required Actions. This allowance is in recognition that certain testing and maintenance activities must be conducted provided an acceptable level of risk is not exceeded. During MODES 5 and 6, performance of a significant number of required testing and maintenance activities is also required. In MODES 5 and 6, the activities are generally planned and administratively controlled. Relaxations from MODES 1, 2, 3, and 4 LCO requirements are acceptable during shutdown modes based on:

a. The fact that time in an outage is limited. This is a risk prudent goal as well as a utility economic consideration.

b. Requiring appropriate compensatory measures for certain conditions. These may include administrative controls, reliance on systems that do not necessarily meet typical design requirements applied to systems credited in operating MODE analyses, or both.

c. Prudent utility consideration of the risk associated with multiple activities that could affect multiple systems.

d. Maintaining, to the extent practical, the ability to perform required functions (even if not meeting MODES 1, 2, 3, and 4 OPERABILITY requirements) with systems assumed to function during an event.

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case DBA which are analyzed for operating MODES are generally viewed not to be a significant concern during shutdown MODES due to lower energies involved. The Technical Specifications therefore require a lesser complement of electrical equipment to be available during shutdown than is

BASES

APPLICABLE SAFETY ANALYSES (continued)

required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, have found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management" as an Industry initiative to manage shutdown tasks and associated electrical support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The inverters satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

At least one Reactor Protection Instrument AC panel energized by a battery backed inverter provides uninterruptible supply of AC electrical power to at least one Reactor Protection Instrument AC panel even if the 4 kV safeguards buses are de-energized.

This ensures the availability of sufficient inverter power to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents).

APPLICABILITY

The inverter required to be OPERABLE in MODES 5 and 6 and during movement of irradiated fuel assemblies provides assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core;

b. Systems needed to mitigate a fuel handling accident are available;

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

BASES

APPLICABILITY (continued)

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

Inverter requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.7.

ACTIONS

LCO 3.0.3 is not applicable while in MODES 5 and 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Entering LCO 3.0.3 while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

A.1, A.2, A.3, and A.4

If the required inverter is inoperable, the remaining OPERABLE Reactor Protection Instrument AC panel power supplies as required by LCO 3.8.10, "Distribution Systems-Shutdown," may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, fuel movement, or operations with a potential for positive reactivity additions. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and operations involving positive reactivity additions that could result in loss of required SDM (MODE 5) or boron concentration (MODE 6)).

BASES

ACTIONS

A.1, A.2, A.3, and A.4 (continued)

Suspending positive reactivity additions that could result in failure to meet the minimum SDM or boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to ensure they do not result in a loss of required SDM.

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required inverter and to continue this action until restoration is accomplished in order to provide the necessary inverter power to the unit safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required inverter should be completed as quickly as possible in order to minimize the time the unit safety systems may be without power.

SURVEILLANCE REQUIREMENTS

SR 3.8.8.1

This Surveillance verifies that the required inverter is functioning properly with all required circuit breakers closed and Reactor

BASES

SURVEILLANCE REQUIREMENTS	SR 3.8.8.1 (continued) Protection Instrument AC panel energized from the inverter. The verification of proper voltage output ensures that the required power is readily available for the instrumentation connected to the Reactor Protection Instrument AC panel. The 7 day Frequency takes into account the reliability of the instrument panel power sources and other indications available in the control room that alert the operator to malfunctions.
REFERENCES	None.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.9 Distribution Systems-Operating

BASES

BACKGROUND

The onsite safeguards AC and DC electrical power distribution systems are divided by train into two redundant and independent electrical power distribution subsystems. The onsite Reactor Protection Instrument AC Distribution System is divided by channels into four separate subsystems (Ref. 1).

Each AC electrical power subsystem consists of a safeguards 4 kV bus and two 480 V buses. These in turn supply power to distribution panels and motor control centers (MCCs). Each safeguards 4 kV bus has two offsite sources of power as well as a dedicated onsite diesel generator (DG) source. Each safeguards 4 kV bus is normally connected to an offsite source. After a loss of this offsite power source, a transfer to the alternate offsite source is accomplished by a load sequencer, initiated by bus undervoltage relays. If all offsite sources are unavailable, the onsite emergency DG supplies power to the safeguards 4 kV bus. Control power for the 4 kV and 480 V bus breakers is supplied from the safeguards DC distribution system. Additional description of the safeguards AC system may be found in the Bases for LCO 3.3.4, "4 kV Safeguards Bus Voltage Instrumentation," and the Bases for LCO 3.8.1, "AC Sources-Operating."

The AC electrical power distribution system for each train includes the safety related buses and MCCs shown in Table B 3.8.9-1.

The 120 V Reactor Protection Instrument AC panels are arranged in four load groups and are normally powered from inverters. An alternate power supply for the instrument panels is the inverter bypass transformer powered from the same MCC as the associated inverter. Another alternate power supply is from the unit 208/120

BASES

BACKGROUND (continued)

VAC interruptable panel. Use of these supplies is governed by LCO 3.8.7, "Inverters-Operating."

There are two independent 125 VDC electrical power distribution subsystems (one for each train). The 125 VDC safeguards electrical power system consists of two independent and redundant safety related DC safeguards electrical power subsystems (Train A and Train B). The sources for each train are a 125 VDC battery, a battery charger, and all the associated control equipment and interconnecting cabling.

The list of the required Reactor Protection Instrument AC and safeguards DC distribution panels is presented in Table B 3.8.9-1.

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the USAR (Ref. 2) assume ESF systems are OPERABLE. The safeguards AC, DC, and Reactor Protection Instrument AC electrical power distribution systems are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the safeguards AC, DC, and Reactor Protection Instrument AC electrical power distribution systems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining power distribution systems OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite power; and

b. A worst case single failure.

BASES

APPLICABLE SAFETY ANALYSES (continued)	The distribution systems satisfy Criterion 3 of 10 CRF 50.36(c)(2)(ii).

LCO

The required power distribution subsystems listed in Table B 3.8.9-1 ensure the availability of safeguards AC, DC, and Reactor Protection Instrument AC electrical power for the systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. The safeguards AC, DC, and Reactor Protection Instrument AC electrical power distribution subsystems are required to be OPERABLE.

Maintaining the Train A and Train B safeguards AC and DC, and Reactor Protection Instrument AC electrical power distribution subsystems OPERABLE ensures that the redundancy incorporated into the design of ESF is not defeated. Therefore, a single failure within any system or within the electrical power distribution subsystems will not prevent safe shutdown of the reactor. This does not preclude redundant safeguards 4 kV buses from being powered from the same offsite path.

OPERABLE AC electrical power distribution subsystems require the associated buses and MCCs to be energized to their proper voltages. OPERABLE DC electrical power distribution subsystems require the associated panels to be energized to their proper voltage from either the associated battery or charger. OPERABLE Reactor Protection Instrument AC electrical power distribution subsystems require the associated panels to be energized to their proper voltage.

BASES (continued)

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs; and

b. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

Electrical power distribution subsystem requirements for MODES 5 and 6 are covered in the Bases for LCO 3.8.10, "Distribution Systems-Shutdown."

ACTIONS

A.1

With one or more safeguards AC electrical power distribution subsystems, inoperable, the remaining AC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, required safeguards AC electrical power, distribution subsystems to be restored to OPERABLE status within 8 hours.

Condition A worst scenario is one train without AC power (i.e., no offsite power to the train and the associated DG inoperable). In this Condition, the unit is more vulnerable to a complete loss of AC power. It is, therefore, imperative that the unit operator's attention be focused on minimizing the potential for loss of power to the remaining train by stabilizing the unit, and on restoring power to the affected train. The 8 hour time limit before requiring a unit shutdown in this Condition is acceptable because of:

BASES

ACTIONS

A.1 (continued)

a. The potential for decreased safety if the unit operator's attention is diverted from the evaluations and actions necessary to restore power to the affected train, to the actions associated with taking the unit to shutdown within this time limit; and

b. The potential for an event in conjunction with a single failure of a redundant component in the train with AC power.

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition A is entered while, for instance, a DC bus is inoperable and subsequently restored OPERABLE, the LCO may already have been not met for up to 2 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the AC distribution system. At this time, a DC circuit could again become inoperable, and AC distribution restored OPERABLE. This could continue indefinitely.

The Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition A was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

Required Action A.1 is modified by a Note that requires the applicable Conditions and Required Actions of LCO 3.8.4, "DC Sources - Operating," to be entered for DC trains made inoperable by inoperable AC power distribution subsystems. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components. Inoperability of a distribution system can result in loss of charging power to batteries and eventual loss of DC power. This Note ensures that the appropriate attention is given to restoring charging power to batteries, if necessary, after loss of distribution systems.

BASES

ACTIONS (continued)

B.1

With one or more safeguards DC electrical power distribution subsystem panel(s) inoperable, the remaining safeguards DC electrical power distribution subsystem is capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining safeguards DC electrical power distribution subsystem could result in the minimum required ESF functions not being supported. Therefore, the required DC panels must be restored to OPERABLE status within 2 hours by powering the bus from the associated battery, charger, or portable charger.

The worst case scenario is one train without safeguards DC power; potentially with both the battery significantly degraded and the associated charger nonfunctioning. In this situation, the unit is significantly more vulnerable to a complete loss of all DC power. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for loss of power to the remaining trains and restoring power to the affected train.

This 2 hour limit is more conservative than Completion Times allowed for the vast majority of components that would be without power. Taking exception to LCO 3.0.2 for components without adequate DC power, which would have Required Action Completion Times shorter than 2 hours, is acceptable because of:

a. The potential for decreased safety by requiring a change in unit conditions (i.e., requiring a shutdown) while allowing stable operations to continue;

b. The potential for decreased safety by requiring entry into numerous applicable Conditions and Required Actions for components without DC power and not providing sufficient time for the operators to perform the necessary evaluations and actions for restoring power to the affected train; and

BASES

ACTIONS

B.1 (continued)

c. The potential for an event in conjunction with a single failure of a redundant component.

The second Completion Time for Required Action B.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, an AC bus is inoperable and subsequently returned OPERABLE, the LCO may already have been not met for up to 8 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the DC distribution system. At this time, an AC train could again become inoperable, and DC distribution restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition B was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

C.1

With one Reactor Protection Instrument AC panel inoperable, the remaining OPERABLE Reactor Protection Instrument AC panels are capable of supporting the minimum safety functions necessary to shut down the unit and maintain it in the safe shutdown condition. Overall reliability is reduced, however, since an additional single failure could result in the minimum ESF functions not being supported. Therefore, the required Reactor Protection Instrument AC panel must be restored to OPERABLE status within 2 hours by powering the panel from the associated inverter , inverter bypass transformer, or interruptible panel.

BASES

ACTIONS

C.1 (continued)

Condition C represents one Reactor Protection Instrument AC panel without power. In this situation, the unit is significantly more vulnerable to a complete loss of all noninterruptible power. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for loss of power to the remaining instrument panels and restoring power to the affected instrument panel.

This 2 hour limit is more conservative than Completion Times allowed for the vast majority of components that are without adequate instrument AC power. Taking exception to LCO 3.0.2 for components without adequate instrument AC power, that would have the Required Action Completion Times shorter than 2 hours if declared inoperable, is acceptable because of:

a. The potential for decreased safety by requiring a change in unit conditions (i.e., requiring a shutdown) and not allowing stable operations to continue;

b. The potential for decreased safety by requiring entry into numerous applicable Conditions and Required Actions for components without adequate instrument AC power and not providing sufficient time for the operators to perform the necessary evaluations and actions for restoring power to the affected train; and

c. The potential for an event in conjunction with a single failure of a redundant component.

The 2 hour Completion Time takes into account the importance to safety of restoring the Reactor Protection Instrument AC panel to OPERABLE status, the redundant capability afforded by the other OPERABLE instrument panels, and the low probability of a DBA occurring during this period.

BASES

ACTIONS

C.1 (continued)

The second Completion Time for Required Action C.1 establishes a limit on the maximum allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition C is entered while, for instance, an AC bus is inoperable and subsequently returned OPERABLE, the LCO may already have been not met for up to 8 hours. This could lead to a total of 10 hours, since initial failure of the LCO, to restore the vital bus distribution system. At this time, an AC train could again become inoperable, and vital bus distribution restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock."

This will result in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition C was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet the LCO indefinitely.

D.1 and D.2

If the inoperable distribution subsystem cannot be restored to OPERABLE status within the required Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

ACTIONS (continued)

E.1

Condition E addresses two trains with inoperable distribution subsystems that result in a loss of safety function, adequate core cooling, containment OPERABILITY and other vital functions for DBA mitigation would be compromised. Condition E also addresses two or more Reactor Protection Instrument AC panels inoperable. If the plant is in this Condition, an immediate plant shutdown in accordance with LCO 3.0.3 is required.

SURVEILLANCE REQUIREMENTS

SR 3.8.9.1

This Surveillance verifies that the required safeguards AC, DC, and Reactor Protection Instrument AC electrical power distribution systems, presented in Table B.3.8.9-1, are functioning properly, with the correct circuit breaker and switch alignment. The correct breaker and switch alignment ensures the appropriate separation and independence of the electrical divisions is maintained, and the appropriate voltage is available to each required subsystem. The verification of proper voltage ensures that the required voltage is readily available for motive as well as control functions for critical system loads. Various indications are available to the operators which demonstrate correct voltage for the subsystems. The 7 day Frequency takes into account the redundant capability of the safeguards AC, DC, and Reactor Protection Instrument AC electrical power distribution subsystems, and other indications available in the control room that alert the operator to subsystem malfunctions.

REFERENCES

1. USAR, Section 8.

2. USAR, Section 14.

Table B 3.8.9-1 (page 1 of 1)
Safeguards AC and DC Electrical Power Distribution Systems

TYPE	DISTRIBUTION EQUIPMENT	UNIT 1 TRAIN A AND B	UNIT 2 TRAIN A AND B
Safeguards AC	4 kV Buses	15, 16	25, 26
	480 V Buses	111, 112, 121, 122	211, 212, 221, 222
	Motor Control Centers	1A1, 1A2 1AB1*, 1AB2* 1AC1, 1AC2 1K1, 1K2, 1KA2 1L1, 1L2 1LA1, 1LA2 1M1, 1M2 1MA1*, 1MA2* 1R1, 1S1 1T1*, 1T2* 1TA1, 1TA2 1X1, 1X2	2A1, 2A2 1AB1*, 1AB2* 2AC1, 2AC2 2K1, 2K2, 2KA2 2L1, 2L2 2LA1, 2LA2 2M1, 2M2 1MA1*, 1MA2* 2R1, 2S1 1T1*, 1T2* 2TA1, 2TA2 2X1, 2X2
Safeguards DC	125 VDC Panels	11, 12 15, 16 14*, 19* 17*, 18* 151, 161 152, 162 153, 163 191	21, 22 25, 26 14*, 19* 17*, 18* 27, 28 251, 261 252, 262 253, 263
Reactor Protection Instrument AC	120 VAC Panels	111, 112, 113, 114	211, 212, 213, 214

* Denotes MCC's or Panels that are transferable between units.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.10 Distribution Systems-Shutdown

BASES

BACKGROUND

A description of the safeguards AC, DC, and Reactor Protection Instrument AC electrical power distribution systems is provided in the Bases for LCO 3.8.9, "Distribution Systems-Operating."

In addition to the safeguards AC, DC, and Reactor Protection Instrument AC electrical power distribution systems listed in Table B 3.8.9-1, the following are examples of alternate power distribution equipment that may also be used during plant shutdown:

a. 4kV bus ties;

b. 480V alternate feeds;

c. Uninterruptable Panel 117 (217 for Unit 2);

d. Uninterruptable Panel 117 to 217 cross tie; and

e. Service Building DC to Safeguards DC cross tie.

This alternate equipment may be used to maintain reliable power to various plant systems and equipment that are required to be OPERABLE to support shutdown conditions. This equipment, when used as an alternate source, comes from the safeguards systems or sources from the other unit (except for Service Building DC to Safeguards DC cross tie which is neither from safeguards systems nor the other unit). Use of these systems or sources has been evaluated and does not have a detrimental impact on the other operating unit.

BASES (continued)

APPLICABLE SAFETY ANALYSES

The OPERABILITY of the minimum safeguards AC, DC, and Reactor Protection Instrument AC electrical power distribution subsystems during MODES 5 and 6, and during movement of irradiated fuel assemblies ensures that:

a. The unit can be maintained in the shutdown or refueling condition for extended periods;

b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and

c. Adequate power is provided to mitigate events postulated during shutdown, such as a fuel handling accident.

In general, when the unit is shut down, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, 3, and 4 have no specific analyses in MODES 5 and 6. Worst case bounding events are deemed not credible in MODES 5 and 6 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

BASES

APPLICABLE SAFETY ANALYSES (continued)

During MODES 1, 2, 3, and 4, various deviations from the analysis assumptions and design requirements are allowed within the Required Actions. This allowance is in recognition that certain testing and maintenance activities must be conducted provided an acceptable level of risk is not exceeded. During MODES 5 and 6, performance of a significant number of required testing and maintenance activities is also required. In MODES 5 and 6, the activities are generally planned and administratively controlled. Relaxations from MODES 1, 2, 3, and 4 LCO requirements are acceptable during shutdown modes based on:

a. The fact that time in an outage is limited. This is a risk prudent goal as well as a utility economic consideration.

b. Requiring appropriate compensatory measures for certain conditions. These may include administrative controls, reliance on systems that do not necessarily meet typical design requirements applied to systems credited in operating MODE analyses, or both.

c. Prudent utility consideration of the risk associated with multiple activities that could affect multiple systems.

d. Maintaining, to the extent practical, the ability to perform required functions (even if not meeting MODES 1, 2, 3, and 4 OPERABILITY requirements) with systems assumed to function during an event.

The safeguards AC and DC electrical power distribution systems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES (continued)

LCO

Various combinations of subsystems, equipment, and components are required OPERABLE by other LCOs, depending on the specific plant condition. Implicit in those requirements is the required OPERABILITY of necessary support required features. This LCO explicitly requires energization of the portions of the electrical distribution system, as presented in Table B 3.8.9-1, necessary to support OPERABILITY of required systems, equipment, and components - all specifically addressed in each LCO and implicitly required via the definition of OPERABILITY. In addition, the alternate equipment described in the Background Section may be used to maintain OPERABILITY of the Electrical Distribution subsystems.

Maintaining these portions of the distribution system energized ensures the availability of sufficient power to operate the unit in a safe manner to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents).

APPLICABILITY

The AC and DC electrical power distribution subsystems required to be OPERABLE in MODES 5 and 6, and during movement of irradiated fuel assemblies, provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core;

b. Systems needed to mitigate a fuel handling accident are available;

c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition and refueling condition.

The safeguards AC, DC, and Reactor Protection Instrument AC electrical power distribution subsystems requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.9

BASES (continued)

ACTIONS

LCO 3.0.3 is not applicable while in MODES 5 and 6. However, since irradiated fuel assembly movement can occur in MODE 1, 2, 3, or 4, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operations. Entering LCO 3.0.3 while in MODE 1, 2, 3, or 4 would require the unit to be shutdown unnecessarily.

A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5

Although redundant required features may require redundant trains of electrical power distribution subsystems to be OPERABLE, one OPERABLE distribution subsystem train may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS and fuel movement. By allowing the option to declare required features associated with an inoperable distribution subsystem inoperable, appropriate restrictions are implemented in accordance with the affected distribution subsystem LCO's Required Actions. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies, and operations involving positive reactivity additions that could result in loss of required SDM (MODE 5) or boron concentration (MODE 6)). Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes including temperature increases when operating with a positive MTC must also be evaluated to not result in reducing core reactivity below the required SDM or refueling boron concentration limit.

BASES

ACTIONS

A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5 (continued)

Suspension of these activities does not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required safeguards AC and DC electrical power distribution subsystems and to continue this action until restoration is accomplished in order to provide the necessary power to the unit safety systems

Notwithstanding performance of the above conservative Required Actions, a required residual heat removal (RHR) subsystem may be inoperable. In this case, Required Actions A.2.1 through A.2.4 do not adequately address the concerns relating to coolant circulation and heat removal. Pursuant to LCO 3.0.6, the RHR ACTIONS would not be entered. Therefore, Required Action A.2.5 is provided to direct declaring the associated RHR inoperable, which results in taking the appropriate RHR actions.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required distribution subsystems should be completed as quickly as possible in order to minimize the time the unit safety systems may be without power.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.8.10.1

This Surveillance verifies that the safeguards AC, DC, and Reactor Protection Instrument AC electrical power distribution subsystems are functioning properly, with the required buses and panels energized. The verification of proper voltage availability on the buses ensures that the required power is readily available for motive as well as control functions for critical system loads connected to these buses. The 7 day Frequency takes into account the capability of the electrical power distribution subsystems, and other indications available in the control room that alert the operator to subsystem malfunctions.

REFERENCES

None.

B 3.9 REFUELING OPERATIONS

B 3.9.1 Boron Concentration

BASES

BACKGROUND

The limit on the boron concentrations of the Reactor Coolant System (RCS) and the refueling cavity during refueling ensures that the reactor remains subcritical during MODE 6. Refueling boron concentration is the soluble boron concentration in the coolant in each of these volumes having direct access to the reactor core during refueling.

The soluble boron concentration offsets the core reactivity and is measured by chemical analysis of a representative sample of the coolant in each of the volumes. The refueling boron concentration and associated shutdown margin limits are specified in the COLR. The required boron concentration will vary depending on time in core life. Plant procedures ensure the specified boron concentration in order to maintain an overall core reactivity of $k_{eff} \leq 0.95$ during fuel handling, with control rods and fuel assemblies assumed to be in the most adverse configuration (least negative reactivity) allowed by plant procedures.

AEC GDC Criterion 27 (Ref. 1) requires that two independent reactivity control systems of different design principles be provided. AEC GDC Criterion 29 (Ref. 1) requires at least one of these systems must be capable of holding the reactor core subcritical under any condition. The Chemical and Volume Control System (CVCS), Safety Injection (SI) and Residual Heat Removal (RHR) are the systems capable of maintaining the reactor subcritical in cold conditions by maintaining the boron concentration.

The reactor is brought to shutdown conditions before beginning operations to open the reactor vessel for refueling. After the RCS is cooled and depressurized and the vessel head is unbolted, the head is slowly removed to form the refueling cavity. The refueling cavity is then flooded with borated water from the refueling water storage

BASES

BACKGROUND (continued)

tank through the open reactor vessel by gravity feeding or by the use of the Residual Heat Removal (RHR) System pumps.

The pumping action of the RHR System in the RCS and the natural circulation due to thermal driving heads in the reactor vessel and refueling cavity mix the added boric acid with the water. The RHR System is in operation during refueling (see LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-High Water Level," and LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation-Low Water Level") to provide forced circulation in the RCS and assist in maintaining the boron concentrations in the RCS and the refueling cavity above the appropriate COLR limits.

APPLICABLE SAFETY ANALYSES

During refueling operations, the reactivity condition of the core is consistent with the initial conditions assumed for the boron dilution accident in the accident analysis for MODE 6. The boron concentration limits specified in the COLR are based on the core reactivity at one or more points in the fuel cycle and include an uncertainty allowance.

The required boron concentration and the plant refueling procedures that verify the correct fuel loading plan (including full core mapping) ensure that the k_{eff} of the core will remain ≤ 0.95 during the refueling operation. Hence, an adequate margin of safety is established during refueling.

During refueling, the water volume in the spent fuel pool, the transfer canal, the refueling cavity, and the reactor vessel form a single mass. As a result, the soluble boron concentration is relatively the same in each of these volumes.

The analyzed boron dilution accident requiring the highest boron concentration occurs in MODE 6 (Ref. 2).

BASES

APPLICABLE SAFETY ANALYSES (continued)

The RCS boron concentration satisfies Criterion 2 of 10 CFR 50.36 (c)(2)(ii).

LCO

The LCO requires that a minimum boron concentration be maintained in the RCS and the refueling cavity while in MODE 6. The boron concentration limits specified in the COLR ensure that a core k_{eff} of $\leq$ 0.95 or other lower value is maintained during fuel handling operations. Violation of the LCO could lead to an inadvertent criticality during MODE 6.

APPLICABILITY

This LCO is applicable in MODE 6 to ensure that the fuel in the reactor vessel will remain subcritical. The required boron concentration ensures a k_{eff} of $\leq$ 0.95 or a lower value based on the dilution analysis. Above MODE 6, LCO 3.1.1, "SHUTDOWN MARGIN (SDM)" ensures that an adequate amount of negative reactivity is available to shut down the reactor and maintain it subcritical.

The Applicability is modified by a Note. The Note states that the limits on boron concentration are only applicable to the refueling cavity when connected to the RCS. When the refueling cavity is isolated from the RCS, no potential path for boron dilution exists.

ACTIONS

A.1 and A.2

Continuation of CORE ALTERATIONS or positive reactivity additions (including actions to reduce boron concentration) is contingent upon maintaining the unit in compliance with the LCO. If the boron concentration of any coolant volume in the RCS or the refueling cavity, when connected, is less than that needed to maintain shutdown margin within its limit, all operations involving CORE ALTERATIONS or positive reactivity additions must be

BASES

ACTIONS

A.1 and A.2 (continued)

suspended immediately.

Suspension of CORE ALTERATIONS and positive reactivity additions shall not preclude moving a component to a safe position.

Operations that individually add limited positive reactivity (e.g., temperature fluctuations from inventory addition or temperature control fluctuations), but when combined with all other operations affecting core reactivity (e.g., intentional boration) result in overall net negative reactivity addition, are not precluded by this action.

A.3

In addition to immediately suspending CORE ALTERATIONS and positive reactivity additions, boration to restore the concentration must be initiated immediately.

In determining the required combination of boration flow rate and concentration, no unique Design Basis Event must be satisfied. The only requirement is to restore the boron concentration to its required value as soon as possible. In order to raise the boron concentration as soon as possible, the operator should begin boration with the best source available for unit conditions.

Once actions have been initiated, they must be continued until the boron concentration is restored. The restoration time depends on the amount of boron that must be injected to reach the required concentration.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.9.1.1

This SR ensures that the coolant boron concentration in the RCS, and connected portions of the refueling cavity, is within the COLR limits. The boron concentration of the coolant in each required volume is determined periodically by chemical analysis. Prior to re-connecting portions of the refueling cavity to the RCS, this SR must be met per SR 3.0.4. If any dilution activity has occurred while the cavity was disconnected from the RCS, this SR ensures the correct boron concentration prior to communication with the RCS.

A minimum Frequency of once every 72 hours is a reasonable amount of time to verify the boron concentration of representative samples. The Frequency is based on operating experience, which has shown 72 hours to be adequate.

REFERENCES

1. AEC "General Design Criteria for Nuclear Power Plant Construction Permits," Criteria 27 and 29, issued for comment July 10, 1967, as referenced in USAR, Section 1.2.

2. USAR, Chapter 14.4.

B 3.9 REFUELING OPERATIONS

B 3.9.2 Refueling Cavity Water Level

BASES

BACKGROUND	The movement of irradiated fuel assemblies within containment requires a minimum water level of 23 ft above the top of the reactor vessel flange. During refueling, this maintains sufficient water level in the containment, fuel transfer canal, refueling cavity, and spent fuel pool. Sufficient water is necessary to retain iodine fission product activity in the water in the event of a fuel handling accident (Refs. 1 and 2). Sufficient iodine activity would be retained to limit offsite doses from the accident to < 25% of 10 CFR 100 limits.
APPLICABLE SAFETY ANALYSES	During movement of irradiated fuel assemblies, the water level in the refueling cavity is an initial condition design parameter in the analysis of a fuel handling accident in containment, as postulated by Reference 1. A minimum water level of 23 ft (Regulatory Position C.1.c of Ref. 1) allows a decontamination factor of 100 (Regulatory Position C.1.g of Ref. 1) to be used in the accident analysis for iodine. This relates to the assumption that 99% of the total iodine released from the pellet to cladding gap of all the dropped fuel assembly rods is retained by the refueling cavity water. The fuel pellet to cladding gap is assumed to contain 10% of the total fuel rod iodine inventory (Ref. 1). The fuel handling accident analysis inside containment is described in Reference 2. With a minimum water level of 23 ft and a minimum decay time of 100 hours prior to fuel handling, the analysis and test programs demonstrate that the iodine release due to a postulated fuel handling accident is adequately captured by the water and offsite doses are maintained within allowable limits (Refs. 3 and 4). Refueling cavity water level satisfies Criterion 2 of 10 CFR 50.36 (c)(2)(ii).

BASES (continued)

LCO	A minimum refueling cavity water level of 23 ft above the reactor vessel flange is required to ensure that the radiological consequences of a postulated fuel handling accident inside containment are within acceptable limits.
APPLICABILITY	LCO 3.9.2 is applicable when moving irradiated fuel assemblies within containment. The LCO minimizes the possibility of a fuel handling accident in containment that is beyond the assumptions of the safety analysis. If irradiated fuel assemblies are not present in containment, there can be no significant radioactivity release as a result of a postulated fuel handling accident. Requirements for fuel handling accidents in the spent fuel pool are covered by LCO 3.7.15, "Spent Fuel Storage Pool Water Level."
ACTIONS	A.1 With a water level of < 23 ft above the top of the reactor vessel flange, all operations involving movement of irradiated fuel assemblies within the containment shall be suspended immediately to ensure that a fuel handling accident cannot occur. The suspension of fuel movement shall not preclude completion of movement of a fuel assembly to a safe position.
SURVEILLANCE REQUIREMENTS	SR 3.9.2.1 Verification of a minimum water level of 23 ft above the top of the reactor vessel flange ensures that the design basis for the analysis of the postulated fuel handling accident during refueling operations is met. Water at the required level above the top of the reactor vessel

BASES

SURVEILLANCE REQUIREMENTS

SR 3.9.2.1 (continued)

flange limits the consequences of damaged fuel rods that are postulated to result from a fuel handling accident inside containment (Ref. 2).

The Frequency of 24 hours is based on engineering judgment and is considered adequate in view of the large volume of water and the normal procedural controls of valve positions, which make significant unplanned level changes unlikely.

REFERENCES

1. Regulatory Guide 1.25, March 23, 1972.

2. USAR, Section 14.5.

3. 10 CFR 100.10.

4. Malinowski, D. D., Bell, M. J., Duhn, E., and Locante, J., WCAP-7828, Radiological Consequences of a Fuel Handling Accident, December 1971.

B 3.9 REFUELING OPERATIONS

B 3.9.3 Nuclear Instrumentation

BASES

BACKGROUND

Core subcritical neutron flux monitors are used during refueling operations to monitor the core reactivity condition. The installed core subcritical neutron flux monitors are part of the Nuclear Instrumentation System (NIS). These detectors (N-31, N-32, N-51, and N-52) are located external to the reactor vessel and detect neutrons leaking from the core.

The installed core subcritical neutron flux monitors are:

a. BF3 detectors operating in the proportional region of the gas filled detector characteristic curve; or

b. Fission chambers.

The detectors monitor the neutron flux in counts per second. The instrument range used for monitoring changes in subcritical multiplication typically covers six decades of neutron flux. The detectors provide continuous visual indication in the control room. The installed BF3 neutron flux monitors provide an audible indication to alert operators in containment to a possible dilution accident. The NIS is designed in accordance with the criteria presented in Reference 1.

APPLICABLE SAFETY ANALYSES

Two OPERABLE core subcritical neutron flux monitors are required to provide a signal to alert the operator to unexpected changes in core reactivity such as with a boron dilution accident (Ref. 2) or an improperly loaded fuel assembly.

The core subcritical neutron flux monitors satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

BASES (continued)

LCO

This LCO requires that two core subcritical neutron flux monitors, capable of monitoring subcritical neutron flux, be OPERABLE to ensure that redundant monitoring capability is available to detect changes in core reactivity. Neutron detectors N-31, N-32, N-51 and N-52 may be used to satisfy this LCO requirement.

This LCO also requires that one audible countrate circuit, associated with either N-31 or N-32, be OPERABLE to ensure that audible indication is available to alert the operator in containment in the event of a dilution accident or improperly loaded fuel assembly.

APPLICABILITY

In MODE 6, the core subcritical neutron flux monitors must be OPERABLE to determine changes in core reactivity. There are no other direct means available to check core reactivity levels. In MODES 2, 3, 4, and 5, the installed detectors and circuitry are also required to be OPERABLE by LCO 3.3.1, "Reactor Trip System (RTS) Instrumentation."

ACTIONS

A1 and A.2

With only one required core subcritical neutron flux monitor OPERABLE, redundancy has been lost. Since these instruments are the only direct means of monitoring core reactivity conditions, CORE ALTERATIONS and introduction of coolant into the RCS with boron concentration less than required to meet the minimum boron concentration of LCO 3.9.1 must be suspended immediately. Suspending the introduction of coolant into the RCS with boron concentration less than required to meet the minimum boron concentration of LCO 3.9.1 is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation.

BASES

ACTIONS

A.1 and A.2 (continued)

Introduction of temperature changes, including temperature increases when operating with a positive moderator temperature coefficient (MTC), must also be evaluated to not result in reducing SDM below the required value. Performance of Required Action A.1 shall not preclude completion of movement of a component to a safe position.

B.1

With no required core subcritical neutron flux monitor OPERABLE, action to restore a monitor to OPERABLE status shall be initiated immediately. Once initiated, action shall be continued until a required core subcritical neutron flux monitor is restored to OPERABLE status.

B.2

With no required core subcritical neutron flux monitor OPERABLE, there are no direct means of detecting changes in core reactivity. However, since CORE ALTERATIONS and positive reactivity additions that could lead to reducing SDM below the required value are not to be made, the core reactivity condition is stabilized until the core subcritical neutron flux monitors are OPERABLE. This stabilized condition is determined by performing SR 3.9.1.1 to ensure that the required boron concentration exists.

The Completion Time of once per 12 hours is sufficient to obtain and analyze a reactor coolant sample for boron concentration and ensures that unplanned changes in boron concentration would be identified. The 12 hour Frequency is reasonable, considering the low probability of a change in core reactivity during this time period.

BASES

ACTIONS (continued)

C.1 and C2

With no audible core subcritical neutron flux monitor count rate circuit OPERABLE, only visual indication is available and prompt and definite indication of a boron dilution event would be lost. In this situation, the boron dilution event may not be detected quickly enough to assure sufficient time is available for operators to manually isolate the unborated water source and stop the dilution prior to the loss of SHUTDOWN MARGIN. Therefore, action must be taken to prevent an inadvertent boron dilution event from occurring. This is accomplished by isolating all the unborated water flow paths to the Reactor Coolant System. Isolating these flow paths ensures that an inadvertent dilution of the reactor coolant boron concentration is prevented. Since CORE ALTERATIONS and addition of unborated water can not be made, the core reactivity is stabilized until the audible count rate capability is restored.

The Completion Time of "Immediately" assures prompt response by operation and requires an operator to initiate actions to isolate an affected flow path immediately. Performance of Required Actions C.1 and C.2 shall not preclude completion of movement of a component to a safe position. Once actions are initiated, they must be continued until all the necessary flow paths are isolated or the circuit is restored to OPERABLE status.

SURVEILLANCE REQUIREMENTS

SR 3.9.3.1

SR 3.9.3.1 is the performance of a CHANNEL CHECK, which is a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that the two indication channels should be consistent with core conditions. Changes in fuel loading and core geometry can result in significant differences between source range channels, but each channel should be consistent with its local conditions.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.9.3.2

The Frequency of 12 hours is consistent with the CHANNEL CHECK Frequency specified similarly for the same instruments in LCO 3.3.1.

SR 3.9.3.2 is the performance of a CHANNEL CALIBRATION every 24 months. This SR is modified by a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION. The 24 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage. Operating experience has shown these components usually pass the Surveillance when performed.

REFERENCES

1. AEC "General Design Criteria for Nuclear Power Plant Construction Permits," Criteria 13, 19, 27 and 31, issued for comment July 10, 1967, as referenced in USAR Section 1.2.

2. USAR, Section 14.4.

B 3.9 REFUELING OPERATIONS

B 3.9.4 Containment Penetrations

BASES

BACKGROUND

During movement of irradiated fuel assemblies within containment, a release of fission product radioactivity within containment will be restricted from escaping to the environment when the LCO requirements are met. In MODES 1, 2, 3, and 4, this is accomplished by maintaining containment OPERABLE as described in LCO 3.6.1, "Containment." In MODE 6, the potential for containment pressurization as a result of an accident is not likely; therefore, requirements to isolate the containment from the outside atmosphere can be less stringent. The LCO requirements are referred to as "containment closure" rather than "containment OPERABILITY." Containment closure means that all potential escape paths are closed or capable of being closed. Since there is no potential for containment pressurization, the Appendix J leakage criteria and tests are not required.

The containment serves to contain fission product radioactivity that may be released from the reactor core following an accident, such that offsite radiation exposures are maintained well within the requirements of 10 CFR 100. Additionally, the containment provides radiation shielding from the fission products that may be present in the containment atmosphere following accident conditions.

The containment equipment hatch, which is part of the containment pressure boundary, provides a means for moving large equipment and components into and out of containment. During movement of irradiated fuel assemblies within containment, the equipment hatch must be held in place by at least four bolts. Good engineering practice dictates that the bolts required by this LCO be approximately equally spaced.

BASES

BACKGROUND (continued)

The containment air locks, which are also part of the containment pressure boundary, provide a means for personnel access during MODES 1, 2, 3, and 4 unit operation in accordance with LCO 3.6.2, "Containment Air Locks." Each air lock has a door at both ends. The doors are normally interlocked to prevent simultaneous opening when containment OPERABILITY is required. During periods of unit shutdown when containment closure is not required, the door interlock mechanism may be disabled, allowing both doors of an air lock to remain open for extended periods when frequent containment entry is necessary.

During movement of irradiated fuel assemblies within containment, containment closure or closure capability is required; therefore, the door interlock mechanism may remain disabled and both doors may be open provided one door can be closed within 30 minutes with at least two containment fan coil unit fans capable of operating in high speed.

The requirements for containment penetration closure ensure that a release of fission product radioactivity within containment will restrict fission product radioactivity release from containment to be within regulatory limits.

The Containment Purge and Exhaust System includes two subsystems, Containment Purge and Containment Inservice Purge. The containment purge subsystem includes a 36 inch purge penetration and a 36 inch exhaust penetration. The second subsystem, a minipurge system referred to as containment inservice purge, includes a 14 inch purge penetration and an 18 inch exhaust penetration.

During MODES 1, 2, 3, and 4, the two valves in each of the containment purge and exhaust penetrations are secured in the closed position, or the penetrations may be blank flanged. The two valves in each of the two containment inservice purge penetrations can be opened intermittently, but are closed automatically by the Containment Ventilation Isolation System.

BASES

BACKGROUND (continued)	In MODE 6, sufficient air flow rates are necessary to conduct refueling operations. The inservice purge system is used for this purpose, and each of the four valves is closed by the radiation monitors associated with the containment inservice purge system in accordance with LCO 3.3.5, "Containment Ventilation Isolation Instrumentation." The 36 inch subsystem is normally blank flanged, although the option for use is allowed during outages, except during movement of irradiated fuel with the air lock doors open. All four containment purge valves are also closed by the Containment Ventilation Isolation Instrumentation. The other containment penetrations that provide direct access from containment atmosphere to outside atmosphere must be isolated on at least one side. Isolation may be achieved by an OPERABLE automatic isolation valve, or by a manual isolation valve, or blind flange, or equivalent. Equivalent isolation methods must be approved and may include use of a material that can provide a temporary, atmospheric pressure, ventilation barrier for the other containment penetrations during fuel movements.
APPLICABLE SAFETY ANALYSES	During CORE ALTERATIONS or movement of irradiated fuel assemblies within containment, the most severe radiological consequences result from a fuel handling accident. The fuel handling accident is a postulated event that involves damage to irradiated fuel (Ref. 1). Fuel handling accidents include dropping a single irradiated fuel assembly and handling tool or a heavy object onto other irradiated fuel assemblies. The requirements of LCO 3.9.2, "Refueling Cavity Water Level," in conjunction with the minimum decay time of 100 hours prior to irradiated fuel movement with containment closure capability ensure that the release of fission product radioactivity, subsequent to a fuel handling accident, results in doses that are well within the guideline values specified in 10 CFR 100. The acceptance limit for offsite radiation exposure is 25% of 10 CFR 100 values.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The requirements for containment penetration closure ensure that a release of fission product radioactivity within containment will restrict fission product release from containment to be well within regulatory limits. The closure restrictions are sufficient to restrict fission product radioactivity release from containment due to a fuel handling accident during refueling.

A fuel handling accident does not cause containment pressurization; however, with an assumed single failure, the operating purge system supply fan is assumed to continue supplying air to containment. To maintain post-fuel handling accident releases well within the limits of 10 CFR 100, only the inservice purge system is allowed to be operating during fuel movement. Two fan coil unit fans are required to operate in the high speed mode following a fuel handling accident to assure that radioactive material in containment is well mixed and any releases will leave containment at a lower concentration over the duration of the accident. The provision that one air lock door is OPERABLE and under procedural control will assure that at least one door remains capable of being closed as required, thus assuring radioactive releases are well within the limits of 10 CFR 100 (Ref. 1).

Containment penetrations satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

The LCO is modified by a Note allowing penetration flow paths with direct access from the containment atmosphere to the outside atmosphere to be unisolated under administrative controls. Administrative controls ensure that 1) appropriate personnel are aware of the open status of the penetration flow path during movement of irradiated fuel assemblies within containment, and 2) specified individuals are designated and readily available to isolate the flow path in the event of a fuel handling accident.

This LCO limits the consequences of a fuel handling accident in containment by limiting the potential escape fission product

BASES

LCO (continued)

radioactivity released with containment.

The LCO requires containment penetrations to meet the following requirements:

a. The equipment hatch is closed and held in place by at least 4 bolts;

b. One door in each air lock is closed, or both doors in each air lock may be open with:

   1. containment (high flow) purge system isolated,

   2. one air lock door capable of being closed, and

   3. at least two containment fan coil unit fans capable of operating in the high speed mode; and

c. Each penetration (including the containment (high flow) purge system and inservice (low flow) purge system) providing direct access from the containment atmosphere to the outside atmosphere is either:

   1. closed by a manual valve, or automatic isolation valve, blind flange, or equivalent: or

   2. capable of being closed by an OPERABLE Containment Ventilation Isolation System.

   A penetration with direct access from the containment atmosphere to the outside atmosphere includes all penetrations open to the containment atmosphere that provide a flow path that leads anywhere outside containment and are open to the atmosphere.

BASES

LCO (continued)	For the OPERABLE containment purge and exhaust penetrations, this LCO ensures that these penetrations are isolable by the Containment Ventilation Isolation System. The OPERABILITY requirements for this LCO require that the automatic purge and exhaust valve closure can be achieved and, therefore, meet the assumptions used in the safety analysis to ensure that releases through the valves are terminated, such that radiological doses are within the acceptance limit.
APPLICABILITY	The containment penetration requirements are applicable during movement of irradiated fuel assemblies within containment because this is when there is a potential for the limiting fuel handling accident. In MODES 1, 2, 3, and 4, containment penetration requirements are addressed by LCO 3.6.1. In MODES 5 and 6, when movement of irradiated fuel assemblies within containment is not being conducted, the potential for a fuel handling accident does not exist. Therefore, under these conditions no requirements are placed on containment penetration status.

BASES (continued)

ACTIONS	<u>A.1</u> If the containment equipment hatch, air locks, or any containment penetration that provides direct access from the containment atmosphere to the outside atmosphere is not in the required status, including the Containment Ventilation Isolation System not capable of automatic actuation when the purge and exhaust valves are open, the unit must be placed in a condition where the isolation function is not needed. This is accomplished by immediately suspending movement of irradiated fuel assemblies within containment. Performance of these actions shall not preclude completion of movement of a fuel assembly to a safe position.
SURVEILLANCE REQUIREMENTS	<u>SR 3.9.4.1</u> This Surveillance demonstrates that each of the containment penetrations required to be in its closed position is in that position. The Surveillance on the open purge and exhaust valves will demonstrate that the valves will function if required during a fuel handling accident. Also the Surveillance will demonstrate that each valve operator has motive power, which will ensure that each valve is capable of being closed by an OPERABLE automatic Containment Ventilation Isolation signal. The Surveillance is performed every 7 days during movement of irradiated fuel assemblies within containment. The Surveillance interval is selected to be commensurate with the normal duration of time to complete fuel handling operations. A surveillance is to be conducted before the start of refueling operations and then in accordance with the frequency specified. As such, this Surveillance ensures that a postulated fuel handling accident that releases fission product radioactivity within the containment will not result in a release of significant fission product radioactivity to the environment.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.9.4.2

This Surveillance demonstrates that each containment purge and exhaust valve actuates to its isolation position on manual initiation or on an actual or simulated high radiation signal. The 24 month Frequency maintains consistency with other similar ESFAS instrumentation and valve testing requirements. In LCO 3.3.5, the Containment Ventilation Isolation instrumentation requires a CHANNEL CHECK every 12 hours and a COT every 92 days to ensure the channel OPERABILITY during refueling operations. A CHANNEL CALIBRATION is performed every 24 months. SR 3.6.3.5 demonstrates that the isolation time of each valve is in accordance with the Inservice Testing Program requirements. These Surveillances, when performed, will ensure that the valves are capable of closing after a postulated fuel handling accident to limit a release of fission product radioactivity from the containment.

The SR is modified by a Note stating that this Surveillance is not required to be met for valves in isolated penetrations. The LCO provides the option to close penetrations in lieu of requiring automatic actuation capability.

REFERENCES

1. USAR, Section 14.5.

B 3.9 REFUELING OPERATIONS

B 3.9.5 Residual Heat Removal (RHR) and Coolant Circulation-High Water Level

BASES

BACKGROUND

The purpose of the RHR System in MODE 6 is to remove decay heat and sensible heat from the Reactor Coolant System (RCS), to provide mixing of borated coolant, and to prevent boron stratification. Heat is removed from the RCS by circulating reactor coolant through the RHR heat exchanger(s), where the heat is transferred to the Component Cooling Water System. The coolant is then returned to the RCS via the RCS cold leg. Operation of the RHR System for normal cooldown or decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the RHR heat exchanger(s) and the bypass. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the RHR System.

APPLICABLE SAFETY ANALYSES

If the reactor coolant temperature is not maintained below 200°F, boiling of the reactor coolant could result. This could lead to a loss of coolant in the reactor vessel which would eventually challenge the integrity of the fuel cladding, which is a fission product barrier. One train of the RHR System is required to be operational in MODE 6, with the water level ≥ 20 ft above the top of the reactor vessel flange, to prevent this challenge. The LCO does permit de-energizing the RHR pump for short durations, under the condition that the boron concentration is not diluted. This conditional de-energizing of the RHR pump does not result in a challenge to the fission product barrier.

The RHR System, during refueling conditions, satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

BASES (continued)

LCO

Only one RHR loop is required for decay heat removal in MODE 6, with the water level $\geq$ 20 ft above the top of the reactor vessel flange. Only one RHR loop is required to be OPERABLE, because the volume of water above the reactor vessel flange provides backup decay heat removal capability.

At least one RHR loop must be OPERABLE and in operation to provide:

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of criticality; and

c. Indication of reactor coolant temperature.

An OPERABLE RHR loop includes a RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to a RCS cold leg.

The LCO is modified by a Note that allows the required operating RHR loop to be removed from service for up to 1 hour per 8 hour period, provided no operations are permitted that would dilute the RCS boron concentration with coolant at boron concentrations less than required to meet the minimum boron concentration of LCO 3.9.1. Boron concentration reduction, with coolant at boron concentrations less than required to assure the RCS boron concentration is maintained, is prohibited because uniform concentration distribution cannot be ensured without forced circulation. This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles and RCS to RHR isolation valve testing. During this 1 hour period, decay heat is removed by natural convection to the large mass of water in the refueling cavity.

BASES (continued)

APPLICABILITY

One RHR loop must be OPERABLE and in operation in MODE 6, with the water level ≥ 20 ft above the top of the reactor vessel flange, to provide decay heat removal. The 20 ft water level was selected because it provides backup capability for heat removal.

Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level < 20 ft are located in LCO 3.9.6, "Residual Heat Removal (RHR) and Coolant Circulation-Low Water Level."

ACTIONS

RHR loop requirements are met by having one RHR loop OPERABLE and in operation, except as permitted in the Note to the LCO.

A.1

If RHR loop requirements are not met, there will be no forced circulation to provide mixing to establish uniform boron concentrations.

Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes, including temperature increases when operating with a positive moderator temperature coefficient (MTC), must also be evaluated to not result in reducing core reactivity below the required SDM or refueling boron concentration limit.

BASES

ACTIONS (continued)

A.2

If RHR loop requirements are not met, actions shall be taken immediately to suspend loading of irradiated fuel assemblies in the core. With no forced circulation cooling, decay heat removal from the core occurs by natural convection to the heat sink provided by the water above the core. A minimum refueling water level of 20 ft above the reactor vessel flange provides an adequate available heat sink.

Suspending any operation that would increase decay heat load, such as loading a fuel assembly, is a prudent action under this condition.

In accordance with LCO 3.9.2, "Refueling Cavity Water Level," movement of irradiated fuel within containment requires a minimum water level of 23 ft above the top of the reactor vessel flange.

A.3

If RHR loop requirements are not met, actions shall be initiated and continued in order to satisfy RHR loop requirements. With the unit in MODE 6 and the refueling water level ≥ 20 ft above the top of the reactor vessel flange, corrective actions shall be initiated immediately.

A.4, A.5, A.6.1, and A.6.2

If no RHR loop is in operation, the following actions must be taken:

a. The equipment hatch must be closed and secured with four bolts;

BASES

ACTIONS

A.4, A.5, A.6.1, and A.6.2 (continued)

b. One door in each air lock must be closed; and

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere must be either closed by a manual or automatic isolation valve, blind flange, or equivalent, or verified to be capable of being closed by an OPERABLE Containment Ventilation Isolation System.

With the RHR loop requirements not met, the potential exists for the coolant to boil, clad to fail, and release radioactive gas to the containment atmosphere. Performing the actions described above ensures that all containment penetrations are either closed or can be closed so that the dose limits are not exceeded.

The Completion Time of 4 hours allows adequate time to fulfill the Required Actions and not exceed dose limits.

SURVEILLANCE REQUIREMENTS

SR 3.9.5.1

This Surveillance demonstrates that the RHR loop is in operation in order to provide sufficient decay heat removal capability and to prevent thermal and boron stratification in the core. The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator in the control room for monitoring the RHR System.

REFERENCES

None.

B 3.9 REFUELING OPERATIONS

B 3.9.6 Residual Heat Removal (RHR) and Coolant Circulation-Low Water Level

BASES

BACKGROUND

The purpose of the RHR System in MODE 6 is to remove decay heat and sensible heat from the Reactor Coolant System (RCS), to provide mixing of borated coolant, and to prevent boron stratification. Heat is removed from the RCS by circulating reactor coolant through the RHR heat exchangers where the heat is transferred to the Component Cooling Water System. The coolant is then returned to the RCS via the RCS cold leg. Operation of the RHR System for normal cooldown decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the RHR heat exchanger(s) and the bypass lines. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the RHR System.

APPLICABLE SAFETY ANALYSES

If the reactor coolant temperature is not maintained below 200°F, boiling of the reactor coolant could result. This could lead to a loss of coolant in the reactor vessel, which could eventually challenge the integrity of the fuel cladding, a fission product barrier. Two trains of the RHR System are required to be OPERABLE, and one train in operation, in order to prevent this challenge.

The RHR System, during refueling conditions, satisfies Criterion 4 of 10 CFR 50.36 (c)(2)(ii).

LCO

In MODE 6, with the water level < 20 ft above the top of the reactor vessel flange, both RHR loops must be OPERABLE.

Additionally, one loop of RHR must be in operation in order to provide:

BASES

LCO (continued)

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of criticality; and

c. Indication of reactor coolant temperature.

An OPERABLE RHR loop consists of an RHR pump, a heat exchanger, valves, piping, instruments and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold leg.

Either RHR pump may be aligned to the Refueling Water Storage Tank (RWST) to support filling or draining the refueling cavity or for performance of required testing.

The LCO contains two Notes which provide clarification of the LCO.

Note 1 permits the RHR pumps to be de-energized for up to 1 hour per 8 hour period. The circumstances for stopping both RHR pumps are to be limited to situations when the outage time is short and the core outlet temperature is maintained > 10 degrees F below saturation temperature. The Note prohibits boron dilution or draining operations when RHR forced flow is stopped.

Note 2 allows one RHR loop to be inoperable for a period of 2 hours provided the other loop is OPERABLE and in operation. Prior to declaring the loop inoperable, consideration should be given to the existing plant configuration. This consideration should include that the core time to boil is short, there is no draining operation to further reduce RCS water level and that the capability exists to inject borated water into the reactor vessel. This permits surveillance tests to be performed on the inoperable loop during a time when these tests are safe and possible.

BASES (continued)

APPLICABILITY

Two RHR loops are required to be OPERABLE, and one RHR loop must be in operation in MODE 6, with the water level < 20 ft above the top of the reactor vessel flange, to provide decay heat removal. Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level ≥ 20 ft are located in LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-High Water Level."

ACTIONS

A.1 and A.2

If less than the required number of RHR loop(s) are OPERABLE, action shall be immediately initiated and continued until the RHR loop is restored to OPERABLE status and to operation or until ≥ 20 ft of water level is established above the reactor vessel flange. When the water level is ≥ 20 ft above the reactor vessel flange, the Applicability changes to that of LCO 3.9.5, and only one RHR loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary for an operator to initiate corrective actions.

B.1

If no RHR loop is in operation, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than that required in the RCS for minimum SDM or refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Introduction of temperature changes,

BASES

ACTIONS

B.1 (continued)

including temperature increases when operating with a positive moderator temperature coefficient (MTC), must also be evaluated to not result in reducing core reactivity below the required SDM or refueling boron concentration limit.

B.2

If no RHR loop is in operation, actions shall be initiated immediately, and continued, to restore one RHR loop to operation. Since the unit is in Conditions A and B concurrently, the restoration of two OPERABLE RHR loops and one operating RHR loop should be accomplished expeditiously.

B.3, B.4, B.5.1 and B.5.2

If no RHR loop is in operation, the following actions must be taken:

a. The equipment hatch must be closed and secured with four bolts;

b. One door in each air lock must be closed; and

c. Each penetration providing direct access from the containment atmosphere to the outside atmosphere must be either closed by a manual or automatic isolation valve, blind flange, or equivalent, or verified to be capable of being closed by an OPERABLE Containment Ventilation Isolation System.

With the RHR loop requirements not met, the potential exists for the coolant to boil, clad to fail, and release radioactive gas to the containment atmosphere. Performing the actions described above